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SOME GRASSLAND PROBLEMS.

By A. H. COCKAYNE, Biologist.

THE importance of grassland to New Zealand agriculture and to the country as a whole has full recognition by both farmers and students of agrostology. Such being the case, one is naturally astonished at the dearth of literature both on the science and practice of our grassland production and management. Until recently all text-books on the subject were of foreign origin, and in many particulars were quite unsuited for New Zealand requirements. This peculiar position in a country where grassland is all-important has to a large extent been altered by the appearance of Dr. F. W. Hilgendorf's book, "Pasture Plants and Pastures of New Zealand." It is a modest little volume of ninety-six pages, and is the first of a series of practical agricultural handbooks being issued by the progressive local publishing house of Whitcombe and Tombs. It consists of five chapters, the first four being devoted to a consideration of the species used or occurring in our pastures. The last chapter deals with the production and management of grassland, and will be of very great value to the farmer. The first four chapters will appeal most strongly to the teacher of agricultural botany, although many points of agricultural value are dealt with

in the description and discussion of each species. Dr. Hilgendorf is to be heartily congratulated on his work, which bears that stamp of originality so sadly lacking in many of our elementary text-books. Published at the popular figure of half a crown, it should be in the hands of every farmer and rural-school teacher, and do much to awaken a lively interest in the study of our grasslands.

In reading the book one is impressed by the influence that has been exerted on the mind of its author by one of our great pasture problems—namely, the successful substitution of long-rotation for short-rotation grassland on much of the arable land of the South Island. Much of the book is dominated by this consideration—to such a degree, in fact, that certain of our other great grassland problems have received but scant consideration. The advocacy by the author of the use of pure or semi-pure pastures (under certain conditions), the restriction of short-lived grasses to truly temporary pastures, and the employment of liberal amounts of cocksfoot all clearly show how the disastrous effect of perennial rye-grass short-rotation grassland has impressed itself on him. No student of agrostology closely connected with the agriculture of the South Island can fail to realize the necessity of abandoning the almost pure rye-grass pasture as the main grassland of the farm over all those soils where the grass is virtually only a biennial. The wonder is that the farmer in such districts has not long since recognized this fact, and modified his mixtures in the direction suggested in the work under discussion. I am confident that Dr. Hilgendorf's book, by stressing the futility of the short-rotation pasture on land unsuitable for its profitable production, will prove of very great value. The many admirable suggestions and methods for replacing rye-grass pastures by those of longer duration should have a great influence towards the betterment of grassland wherever the inferior short-rotation pasture, with its bare ground and lack of humus-production, now holds undisputed sway. To me, however, it is a matter for regret that some of the other equally important master problems of New Zealand agrostology have not been given the consideration that they deserve. The excellent way in which the short-rotation grassland problem has been dealt with only intensifies this regret.

MASTER PROBLEMS OF GRASSLAND IN NEW ZEALAND.

Here one cannot refrain from discussing some of these important problems the successful elucidation of which would have a profound bearing on the future prosperity of New Zealand as an agricultural country. Broadly considered, the master problems of New Zealand applied agrostology can be separated into eight different groups, which may be enumerated under the following headings :—

The profitable increase in production of the tussock grasslands.
The substitution of long-rotation for short-rotation grassland on light arable lands.
The control of succession on the surface-sown grasslands.
The increasing of permanent clovers on long-rotation and permanent pasture.
The profitable grassing of the soils of the Central Volcanic Plateau.
The profitable grassing of gum-land heaths.
The permanent grassing of inferior swamp and peat lands.
The economic position of paspalum and its proper management.

There are, of course, many minor problems, but in the majority of instances they represent some special aspect of one or other of these master problems.

Improvement of Tussock Grassland.—If the area involved is alone considered, this is the most important of all our problems. It is largely a South Island one, the seven-odd million acres that are enumerated as unimproved native grass in the North Island being largely in vegetation other than grass, while a considerable amount is danthonia grass-land of far higher carrying-capacity than any of the unimproved tussock country of the South. Dr. Hilgendorf devotes a section to the improvement of tussock grassland, suggesting the surface-sowing of cocksfoot and other grasses in fair quantities, coupled with a certain amount of cultivation so as to break the surface and make a fairly satisfactory seed-bed. There is no doubt that there is much tussock country that could be greatly improved by these means. Experimental work in many directions on the surface-sowing of tussock grassland is urgently required. To begin with, it would have to be entirely of an experimental nature, as its cost in comparison with the value of the land would be very great, and any runholder would have to be very sure of success before he would embark on the enterprise. Again, the tenure under which much of this country is held is against any extensive adoption of surface-sowing with high-priced seeds. There are without doubt large areas of montane tussock country that would repay ploughing and laying down in permanent grass. It is, however, not really known whether, so far as the individual is concerned, it is not more profitable to increase the holding so as to increase one's flock, rather than increase the average carrying-capacity of the land by laying down grass-land of a better type.

Long-rotation versus Short-rotation Grassland. — Dr. Hilgendorf, as already mentioned, deals fully with this problem. No special section of the book is devoted to its discussion, but reference to it is found right through. I fully concur that cocksfoot must be the dominant grass used in the replacement of perennial rye-grass, and that no Italian rye-grass should be included on the lightest of arable land except in districts where the rainfall is abundant and well distributed. Crested dogstail, as stressed by Dr. Hilgendorf, is certainly the companion bottom grass for cocksfoot pastures on light soils, especially in districts where the summers are not excessively dry. Personally, I am advocating very heavy sowings of dogstail, up to 4 lb. and 6 lb. per acre, along with 12 lb. to 14 lb. of cocksfoot. This heavy seeding of dogstail is ridiculed by many, who say that even if ½ lb. is used the pasture will finally become dogstail-dominant. The reason I am advocating liberal applications of dogstail is to avoid any appreciable amount of bare ground even at the end of the first season, and to obviate any necessity for self-establishment taking place in later years. It is not generally recognized that dogstail in its first year of growth does not throw much herbage, but rapidly produces thick, strong, unpalatable stems. Second-year and older plants, on the contrary, produce much more herbage, and have quite slender and easily-grazed-down stems. This is well shown in dogstail-seed paddocks, where the first year's yield is always the heaviest and best. Where apparently excessive amounts of dogstail are used it is necessary to have plenty of cattle, to avoid undue development of flowering-stems during the first year.

One of the minor problems in establishing cocksfoot-crested-dogstail pastures is what clovers and what quantity should be used. On the Central Development Farm are numerous splendid examples of the value of a large clover content in the vigorous and rapid establishment of cocksfoot. Again, a high clover content with cocksfoot causes the grass to grow much earlier in the spring than when clover is absent. A very good example of this can be seen in the grass plots at the Department's experimental farm at Ashburton. The trouble, however, particularly in the drier soils of the Canterbury Plains, is that our ordinary clovers do not grow sufficiently vigorously on such land. In this connection Dr. Hilgendorf's reference to Lotus corniculatus is of great importance, and this clover may play a very important part in cocksfoot-dogstail mixtures. Dogstail, too, on the drier lands of Canterbury is rather a disappointing grass when compared with its growth in Southland and on the arable land of the Wairarapa and Rangitikei. I am sure, however, that one of the reasons of this is the scanty seeding of the grass that is generally given in Canterbury.

The failure of perennial rye-grass to be even semi-permanent on many soils in New Zealand does not seem to be in any way connected with climate, as rye-grass pastures, for instance, fail in permanence equally in Southland and Canterbury, with climates essentially different.

Control of Succession. — The control of succession on surface-sown grasslands is probably the most important of all our pasture problems. Dr. Hilgendorf does not specifically deal with this phase, but his remark on the inadvisability of sowing the same mixture on sunny faces and dark faces or gullies has bearing on the subject. Over large areas of the surface-sown grassland of the North Island tremendous changes in the composition of the vegetation occur before a state of equilibrium obtains. In many cases the transitional successions occurring may be of grave objection. Bracken, water-fern, piripiri, and manuka successions are examples. The methods adopted for the avoidance of these objectionable successions are not always successful, as the many thousands of acres of ruined bush-burn grassland amply testify. Whether the main cause of the failures to direct succession along lines productive of permanently profitable grassland lies in errors of seeding or errors of management is a matter requiring careful study. Methods to secure the combining of other grasses in the danthonia succession that has occurred and is occurring over hundreds of thousands of acres in the North Island is also one of the outstanding features of the succession problem.

Increasing Clover Content. — One of the great weaknesses of permanent pasture in many districts is the small clover content. In many cases excellent pastures are considerably reduced in value by either containing only a volunteer growth of suckling-clover during the early summer, or having an intermittent growth of white clover depending largely on the weather conditions that are experienced. In nearly every case an increase in clover seems to strengthen the grasses of a pasture. I am confident that much of the value of top-dressing pastures is due to the vigour given the grass through a good development of clovers being secured. This is a matter of much moment, and brings up the consideration of the employment of clover-seed along with the top-

dressing used, together with practical methods of preparing permanent-pasture land so that clovers may establish when surface-sown.

Pumice and Gum-land Soils.—The grassing of pumice and gum-land soils has advanced considerably during the past few years, and large tracts of such country, at one time virtually useless, are rapidly becoming converted into useful grassland. Much, however, remains to be learnt as to the most efficacious and practical methods of treatment. These problems are largely ones of soil-amelioration, but apart from these the question of the real value of paspalum as a dominant grass and its treatment is of great immediate moment.

Inferior Swamp-lands.—Methods for grassing swamps and bogs of a more or less inferior character form a problem that is yearly becoming of more importance. Much has been accomplished in recent years, but the subject contains more minor problems of definitely local application than any other phase of applied agrostology. Methods that are admirable in one swamp altogether fail when tried in other places; in fact, no hard-and-fast rules can be followed with regard to drainage, burning, cultivation, and mixtures that should be used.

The Position of Paspalum.—Dr. Hilgendorf's remarks refer almost entirely to the earlier application of this grass to the richer swamp-lands of North Auckland. They do not indicate that paspalum appears to be destined to become the dominant grass of the northern half of the North Island, just as cocksfoot is in the southern half.

In the early days of its introduction paspalum was used most extensively in rich swamp soils, a position where to-day it is not countenanced. In certain classes of swamps it is still used, but such are those where grasses of the foxtail-timothy type are not successful. The types of swamps where paspalum appears to be superior to other grasses are three in number: (1) Swamps extremely wet at some portion of the year and incapable of proper drainage; (2) swamps that have been irregularly burnt, and where great masses of timber impracticable to remove are exposed; (3) fairly well-drained swamps that turn into an almost pure rush association in a few years when sown with an ordinary mixture.

However, it is not with regard to swamp-lands that paspalum owes its importance throughout the whole of the Auckland Province. It is being used extensively in general mixtures for the formation of ordinary permanent pasture, and also with Italian rye-grass for the production of special paspalum paddocks. With regard to the special paspalum paddock, no one can deny its immense value in the North, especially on land devoted to dairying. No surer summer forage can be grown, and as a milk-producer it is without a rival. So far as production is concerned it is certainly the cheapest fodder that can be grown for cows. Its unvarying reliability to produce succulent summer grazing in abundance under both wet and dry conditions makes it invaluable in all the warm districts of New Zealand where the winters are not too severe to check its proper growth in the late spring.

As an ingredient in general-pasture mixtures no such eulogy can be confidently given to paspalum. Many farmers consider that its presence in ordinary permanent pasture is to be avoided, as it will finally crowd out all other grasses, become sod-bound, and be impossible either to eradicate or be brought into profitable growth. Other farmers,

on the contrary, assert that even when dominant it is superior to the ordinary mixed pasture. So far as eliminating undesirable successions, such as bracken and blackberry, paspalum is of great value, and its power in this respect has been amply demonstrated on much previously ruined grassland in the Auckland Province.

No grass has so many friends and at the same time so many enemies. It is, however, being included in many thousands of acres of sowing each year, and its real value and proper management are matters that deserve earnest attention.

DEMODECIC MANGE IN PIGS.

By H. W. CARBURY, M.R.C.V.S., Acting Officer in Charge, Wallaceville Laboratory.

DURING the last year two specimens have been received at the Wallaceville Laboratory of follicular or demodecic mange affecting pigs. As these are the first specimens of this condition which have been recognized in this country, they are considered worthy of a short notice. The causal agent is a very small parasite, $\frac{1}{75}$ in. to $\frac{1}{100}$ in. long, elliptical or laurel-leaf in shape, with four pairs of stumpy legs on each side of the body. This parasite lays eggs which on hatching give rise to an immature form of the parasite, subsequent changes resulting in the perfect demodex.

The parasite was first found in man in 1842 in the comedones or blackheads of the face, in which it appears to cause no injury. In the sheep, horse, and cat it also appears to be inoffensive. In the dog it gives rise to a very intractable form of mange, and in the ox, goat, and pig it produces a pustular eruption of the skin. The parasite is found in the hair-follicles and sebaceous glands of the skin, especially in the vicinity of the snout, neck, under-part of breast, flank, groin, belly, and the inner sides of the thighs. Although there is only one genus there are several varieties, distinguished only by their size and shape.

The specimens shown in the accompanying photograph give a very good idea of this disease, two different conditions of the same disease being shown. On the smaller specimen the pustular condition is well marked by elevations of the skin averaging in size a lentil; these when incised discharge a creamy material containing a large number of the parasites. The pustules showed no evidence of inflammation, their colour not being altered in any way from the surrounding skin.

In the large specimen, which has been incised and a portion of the skin reflected, the pustules are much more deeply set in the subcutaneous tissue, their presence being almost impossible to detect by manipulation alone. They appear as round, yellowish, sharply delimitated centres about the size of a hemp-seed. The limb, as can be clearly seen, is practically riddled with them. Contrary to what is usually found, the lesions were much more numerous on the outside

SPECIMENS OF DEMODECIC MANGE IN THE PIG. [*Photographed at Wallaceville Laboratory.*

of this limb and gradually became fewer, though somewhat larger, as they were followed inward and downward towards the back of the knee-joint. Much more severe cases of this condition are recorded in which pustules gradually increased in size, or several pustules may coalesce, giving rise to large abscesses which on opening leave deep penetrating ulcers. In old-standing cases the skin becomes permanently thickened as a result of continued irritation.

The contagious nature of this condition has not been definitely shown. Csokor observed a herd of twenty-two pigs in which all were affected, while Lindqvist, of Stockholm, has only seen one animal affected in a herd of two hundred. Although further information was requested regarding evidence of contagion in connection with the specimens just described, no such information has yet come to hand.

From a practical standpoint demodecic mange in the pig is of some importance, and this note may be useful in drawing attention to the fact that such a condition exists. I trust it may also result in more specimens of the disease, with full particulars regarding the cases, being forwarded to the Laboratory, with the end in view of adding to the small amount of information recorded in connection with this particular form of scabies.

THE KEEPING OF MILKING-GOATS.

THE whole subject of the keeping of goats for milking purposes deserves far more attention in New Zealand than it is at present receiving. We have only to look round and see the large number of unoccupied or partly occupied sections, and patches of rough hilly ground growing nothing but scrub and weeds adjacent to many workers' homes, to recognize that there is a splendid opening for people with limited capital to bring these into profitable use with much benefit to themselves and good results to the land. Thousands of acres at present lying idle in small patches all over the country could be leased at a mere nominal rent, or even secured rent-free in return for keeping down the weeds. Again, many home sections in our outer suburban districts are large enough to run a milking-goat; tethering can be largely practised in such situations.

Goats as a means for supplying the home with a pure wholesome milk have, indeed, been woefully neglected in this country, especially when we see what beneficial advances have been made in that respect all over the world. This apathy is probably largely due to the fact that animals of good milking-strains have not been imported. The best milkers are found in the Toggenburg-Swiss and the Anglo-Nubian breeds and their crosses. It is not unusual for these animals to reach a yield of three or four quarts per day. Goats, it may be mentioned, follow closely upon the lines of sheep in breeding and mating. Further information on the subject generally will be gladly given by the Department to inquirers who may propose to keep goats. A movement in this direction is directly in the interests of national economy.—*The Live-stock Division.*

CARE OF THE HORSE'S FOOT.

SOME POINTS IN FARRIERY.

By G. FORD, Inspector of Stock, Hawera.

IT has been said that no subject has caused more difference of opinion and bad feeling among horseowners and farriers than the question of the care of horses' feet, and the writer hopes that these brief notes may help to remove some misunderstandings on the matter. Most persons connected with horses consider themselves authorities on the subject, and qualified to advise how a horse's foot should be cared for and shod, irrespective of whether they have any knowledge of the structural conformation and the anatomy of the organs of locomotion. The anatomical side, however, is outside the scope of the present notes, the idea being to deal with the matter from a practical point of view.

"No hoof, no horse" is an apt saying, and is absolutely true where the horse is used for work on macadamized roads or on hilly or stony country. In a state of nature wear does not exceed growth. In fact, on soft and swampy country growth exceeds wear in the unshod foot; and in such conditions it is necessary that the foot be dressed and attended to at least once in every three months.

Hereditary transmission plays an important part in the foot of the horse. All sires with badly shaped, brittle, bad feet and pasterns should be viewed with suspicion. The same applies to the dam.

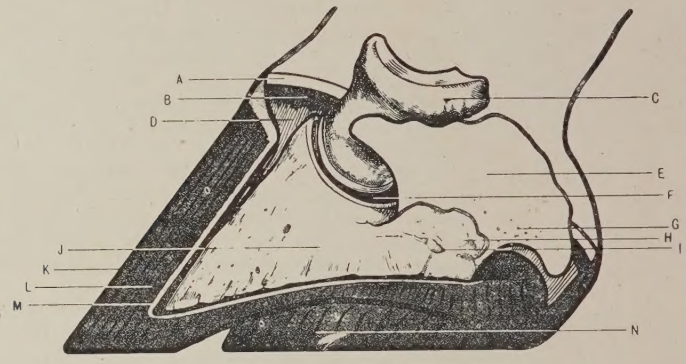
From the time the foal is a few weeks old the feet should receive attention, and any tendency to abnormal conditions at once attended to by dressing the feet, and, if necessary, having a shoe applied to correct the abnormal tendency. It is wonderful what can be done at this stage of the animal's existence in regard to correcting bad conditions and making the animal useful later on in life.

Without entering into the question of horn-producing structure, the foot can be considered as a horny box consisting of walls, quarters, sole, bars, and frog, inside of which is contained a wonderful mechanism. All efforts of horse-shoeing should be to keep that box in a good natural healthy condition, despite the necessary evil of having to protect the foot with a metal band.

HINTS ON SHOEING.

Assuming that the foot has already a shoe on which is worn out, and a new one required, the removal of the shoe is the first consideration after careful examination to see what part of it is most worn and any peculiarity in its wear. To remove the shoe all clinches must be cut clean; then with the pincers seize the shoe between the sole and shoe at outside heel, and give the pincers a strong wrench forward and inward, slackening the shoe; do the same on the inside, repeating on the outside toward the toe until the shoe is slackened, when the nails can easily be pulled out with the pincers. After the shoe is off remove all broken nails and stubs from the foot.

To prepare the hoof on a healthy foot the knife should be used as little as possible. All that the knife is required to do is to pare off any loose pieces of frog, and with the back of it to clean out the cleft of the frog to make sure no signs of thrush are present. In some cases also it may be necessary to remove a small quantity of semi-detached flakes of horn from the sole. The rasp must be used in levelling and shaping the foot, but if a foot is greatly overgrown it can be quickly shortened with sharp hoof-cutters and then dressed with the rasp. The wall should be levelled on the sole-surface to its full thickness, until the narrow line between sole and wall and a small margin of the sole are on a level for a bearing-surface for the shoe (properly this is the bearing-surface of the hoof). The bars must be left intact, but



[*From drawing by H. C. Wilkie, F.R.C.V.S.*

SECTION OF HORSE'S FOOT.

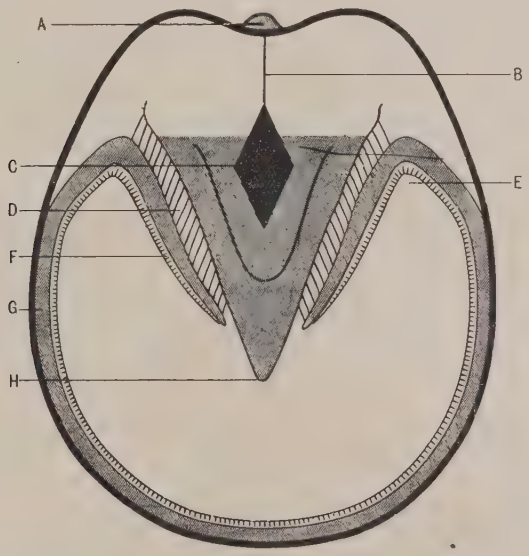
(A) Inner surface of the periople or coronary frog-band. (B) Groove for the reception of the coronary cushion—the cutigeral groove. (C) The second phalanx, or os coronæ. (D) The horny laminæ. (E) The lateral fibro-cartilage. (F) The joint between the os coronæ and the os pedis. (G) Foramina in the lateral fibro-cartilage for the passage of veins. (H) The basilar process of the os pedis. (I) The preplantar notch converted into a foramen. (J) The body of the os pedis. (K) The periople. (L) The wall of the hoof. (M) The horny laminæ. (N) The frog.

the sole between the heel and bars should be a little lower than the wall so as not to be pressed on by the inner web of the shoe, as in many cases the shoe pressing on this point is the cause of corns. If in a healthy condition, the frog should project below the level of the walls and be on a level with the ground-surface of the shoe or a little lower.

The levelling of the hoof is one of the most important points in the care of the horse's foot. Having the foot higher on one side than the other alters the balance and throws an undue strain on that side. In using a rasp there is a tendency on the part of the floorman to lower the side on which he works. Thus a right-handed man has a tendency to lower the outside of the near feet and the inside of the off feet, while a left-handed workman has the opposite tendency. The person who

prepares a foot for the shoe must discern how much hoof to remove and how much to leave, as in either case mistake may lead to injury. When the hoof has been dressed on the sole-surface and shaped on the outside edges it can be dressed on the wall side, so as to maintain the natural angle of the wall of the hoof from coronet to sole. To see if the foot is level, hold the leg by the cannon-bone above the fetlock-joint. The foot then hangs naturally, and one can easily see which side is highest.

The fixing of a piece of iron or mild steel to the under-surface of the foot by means of nails which pierce the wall and are clinched on the outside is the form of protection most commonly in use at the present day. In selecting the size of iron or steel for a shoe consideration has



[*From drawing by H. C. Wilkie, F.R.C.V.S.*

SOLE OF THE HOOF.

(A) Medium point of the upper part of the hoof at the heel. (B), (C) Median lacuna or cleft of frog. (D) Commissures of frog or lateral lacunæ. (E) Sole. The pointer is on that part where the inflection of the wall takes place, forming the "bars." (F) White line, or junction of the wall and the sole. (G) Wall. (H) Apex of frog.

to be given to the class of work the horse is engaged in. A horse used in farm-work can go with a lighter shoe than if used on paved streets or hilly metalled roads. The ordinary draught horse, large enough to pull a ton weight up a fair hill in town, requires shoes made from iron 1¼ in. by ½ in.; if used on lighter work, shoes made from 1 in. by ½ in.

stuff would do. Ordinary express and light-van horses take $\frac{7}{8}$ in. to 1 in. by $\frac{1}{2}$ in., saddle and carriage horses $\frac{5}{8}$ in. to $\frac{3}{4}$ in. by $\frac{3}{8}$ in. or $\frac{1}{2}$ in., and ponies lighter material.

Shoes can either be punched or fullered for nail-holes. For light work fullering seems preferable, as the fullered surface gives a better grip of the ground than the surface of a punched shoe. The fullering or gutter for the nail-holes should be of shape and size to fit the head and neck of the nails. The same applies to a punched shoe, as if the nail-holes are not made to fit the nails no end of trouble ensues from loose shoes and shoes coming off through broken nails caused by badly punched nail-holes. The punching of nail-holes in a shoe is a matter to be carefully considered, and no nail should be driven where there is a crack or broken piece of hoof.

The number of nails in a shoe should be no more than is required to keep the shoe firm and in place, and normally should be placed equal distances apart from the toe to the quarters. In the ordinary run of saddle and light-harness horses six nails in each shoe are sufficient. The size of nails used should be in accordance with the weight of the shoe, condition of the hoof, and work in which the horse is used—sizes 6 and 7 for light horses, 8, 9, and 10 for harness and spring-van animals, and 11 and 12 for heavy horses shod with heels and toes.

The making and fitting of a shoe requires a good deal more attention than is usually given to the work. On the foot-surface the shoe should be absolutely smooth and level, and have no hollows from hammer-marks through using a bad-faced hammer or anvil. The clip should be firm and in the middle of the shoe in a direct line with the cleft and point of the frog, and set into the natural angle of the hoof, so that when nailed on the shoe is on the same angle as the hoof from coronet to ground-surface and simply a continuation of the natural shape of the foot.

In cases where a clip is not properly set the farrier's knife is too often called into use, and a piece gouged out of the wall of the hoof almost into the quick to give the shoe a "seat," as some workmen term it. The result is that when the shoe is nailed on the clip has to be hammered into the angle of the hoof, and this hammering causes more cases of obscure and undetected lameness after newly shoeing than most owners or farriers are aware of. In fitting a shoe to a foot of normal shape the contour of the wall must be followed as far as the quarters and from there backward to the heels. The shoe is fitted wider and longer than the foot to maintain a base of support, as well as to accommodate the downward and forward growth of the foot. Shoes should always be put on even, the cleft of the frog being in the centre of the foot, and both branches of the shoe at equal distances from it. Shoes without calks should be slightly drawn and narrowed at the heels.

In regard to cold or hot fitting a good deal has been said by advocates on both sides. Actual practice has proved that warm fitting has much to commend it when properly done. The shoe should be fitted to the desired shape, and when of a barely dark red colour it is applied to the prepared surface of the foot and sole just long enough

to scorch. This indicates to the farrier what to remove, and also gives the shoe a seat, thus taking a good deal of strain off the nails. If the hoof has been prepared and the shoe adjusted neither knife nor rasp is required in the fitting, except to remove a very small piece at the toe to allow the clip to come into place. After being fitted the shoe should not be again touched by the fitting-hammer.

The nailing-on of the shoe now calls for some attention. Nails of the right size having been selected, and the shoe being in position, a right-handed workman will drive the toe nail on his right-hand side first, then the toe nail on the opposite side, and so on back to the heel nails. When the first nail has been driven care must be taken to see that the shoe has not been forced over to the opposite side. If that happens the shoe must be pulled over to its proper place before another nail is driven. The floorman should pitch his nails so that, in driving, the point emerges from the hoof at the desired place, this being a matter of practice. In a good foot the nails should come out in a line with one another and a fair distance up the foot. Tightening up the nails should be done in the order in which they are driven—from the toe backward. By starting at the heel, as some floormen do, the shoe is generally drawn too tight on the heels.

The clinching of the nails deserves more attention than is generally given, as in a good many cases the clinches are practically filed off. Some good floormen do not twist the points of the nails off with the driving-hammer when driven, but simply turn them down and, when ready to clinch, cut the points off with a pair of pliers made for the purpose. Whichever style is adopted, the point after being shortened should not be weakened at the point of clinching. A small piece should be scooped out of the wall below the clinch to allow the shortened end of the nail to sink in, so that the turned-down point is level with the surface of the wall, thus preserving the full strength of the clinch. Clinches when made too thin by the rasp are inclined to break off. The clinches, being tapped in with the driving-hammer, can be smoothed off with the smooth side of a partly worn foot-rasp, and on no account must the foot be filed above the clinches. When the job has been finished the shoe should appear as part of the foot.

CONCLUSION.

The whole matter can be summed up in taking care of the young growing foot, and, when the time comes that the evil of protection by shoes is required, keeping the foot and shoe level, together with the use of judgment and common-sense in the handling of the horny box. These notes are concerned only with the care of normal feet, and may be termed physiological as compared with pathological. The latter deals with abnormal conditions of the foot, which is outside the present subject. It may be said there is nothing new in what has been said here. But like many another old story it will be none the worse for being told again if it only influences some of the many people concerned to give a little more attention to the care of the feet of faithful animals who cannot remove ill-fitting, joint-racking, and pinching shoes when work is done, and, like the master, put on comfortable slippers to ease tired joints and sore feet.

THE DRIED-MILK INDUSTRY.

By D. CUDDIE, Director of the Dairy Division.

THERE are probably few people who are not prepared to admit the economical advantage of concentrating foodstuffs in such a way as to make them free from decay or deterioration, and easily portable to markets where the more bulky material in its original state is difficult to procure or not available in the condition or quantity that may be required to meet the full demand of consumers. Dried milk, or milk-powder as it is more frequently termed, may be classified as one of these economical foods which is helping to fill a need of people who are debarred from receiving daily delivery of good and wholesome milk in its ordinary form. As yet, however, milk-powder is not extensively used throughout the world as a substitute for milk in liquid form, or even to materially take the place of condensed milk, which has proved so great a boon to the human family.

It is well known, however, that powdered milk in more than one form is finding a ready sale in different countries, and, as far as can be ascertained, the demand for it is gradually increasing. With the advent of further improvements in the preparation of this product, including its packing in suitable containers, it will doubtless come more into favour by consumers generally, providing it can be placed on the market at a price within the reach of those to whom it may be acceptable.

It is well known that the Great War, now happily ended, has had a direct influence on the milk-powder industry. In the first place the war interfered with the export of the product from Continental countries to Great Britain, and, secondly, the market-value has been forced up to an abnormal degree, which may be gathered from advices recently received from the High Commissioner for New Zealand in London. Quoting from these, in 1914 the price of skim-milk powder ranged from £32 to £40 per ton, according to its method of preparation. Soon after the war broke out the price ranged from £50 to £60 per ton, and in 1917 a further rise of £75 to £80 per ton took place, while its present value has risen to £160 to £175 per ton. It was expected in the trade that Dutch supplies would be available after the war, and that prices would probably drop to pre-war value. It had been ascertained that the total importation of milk-powder into Britain for the year 1915 was 51,018 cwt., but no data were available as to the proportion of skim-milk and whole-milk powder which this quantity contained. The importation statistics since that year were not yet available.

The greatest extension in the preparation of milk-powder has taken place in the United States of America, where milk-powder from skim-milk commands by far the greater attention; and here again the prices have been greatly inflated in that country, also in Canada. As shown by official information received by the Department from Washington and Ottawa, the pre-war price in America for skim-milk powder was

5½d. per pound., while the present price is 12½d. per pound. In Canada the price before the war for whole-milk powder was 10d. per pound, and is now 17½d. per pound. In the case of skim-milk powder the corresponding prices were 6d. and 12d. per pound.

It is, of course, impossible to say at the present juncture what the future value of milk-powder will be in the markets of the world when the effect of the war has subsided. The natural expectation is that there will be a substantial drop, although it is reasonable to suppose that prices may not fall to pre-war rates. The commercial position in regard to the sale of milk-powder may have permanently improved by reason of wider distribution, such as the use of it for Army and Navy supplies, and the greater demand to replace the scarcity of whole milk for civilian consumption in certain parts of the Northern Hemisphere. It is generally conceded, however, that there is much greater scope for a market for skim-milk powder than is the case for a powder made from whole milk or milk which has been standardized as regards its fat content. Recognized authorities all agree that whole-milk powder does not retain its keeping-quality, owing to the butter-fat deteriorating when held at ordinary temperatures, whereas skim-milk powder, being free from fat, remains in good condition indefinitely. The latter product is extensively used by bakers and confectioners, and it is now claimed that saltless butter may be added to skim-milk powder, together with the correct amount of water, and the liquid treated in such a way as to produce a milk almost equal to ordinary milk. Whether such a result may be obtained in commercial practice is open to some doubt, and it is obvious that allowance would have to be made for any deterioration in the saltless butter used for the purpose, for instance, where it may be necessary to use a butter which has been held in cool store in order to secure a regular supply all the year round. For while it may be granted that skim-milk powder remains in first-class condition indefinitely, this cannot be said of either salted or saltless butter.

NEW ZEALAND CONSIDERATIONS.

Notwithstanding all the reports which have been circulated in New Zealand within the last six months regarding the highly profitable nature of manufacturing whole-milk or skim-milk powder for export to other countries, it must be remembered that these assumed profits have not been based on the pre-war prices of the products in question, but mainly on prices which have been far above what may be expected if a large increase in the number of milk-powder factories takes place in various countries now manufacturing butter and cheese only. It is reasonable to suppose that if the drying of milk increases the profit to the producers in New Zealand the same will apply to the producers elsewhere. Therefore the establishment of numerous drying plants on a big scale will require a corresponding extension of the markets of the product so prepared.

The proposal to build and equip several large dried-milk factories in New Zealand, in addition to those already in operation, is probably warranted in view of the information now in possession of the dairy companies directly interested. At the same time it is of the utmost importance to consider the subject in all its bearings before launching out on a general adoption of this branch of dairying, with its attendant

heavy outlay on buildings and machinery as compared with the cost of dairy-factories of the ordinary type. The manufacture of dried milk may only be successfully worked on a comparatively large scale and in a district where there is a supply of milk available from, approximately, three thousand cows within a reasonable distance. The total cost of a factory for the treatment of this quantity if milk has been set down at £20,000, depending largely on the class of machinery installed. Moreover, the different methods employed in the process of changing milk from its liquid state to powder form have been protected by the inventors, and, so far as the most modern systems are concerned, the matter of purchasing the rights to use any one of them, or an agreement to pay a royalty for its use, must be a factor in the calculation of expenditure to be incurred.

Another consideration is the question of selling the yearly output of milk-powder, or entering into an agreement for its disposal, whereby the financial requirements of the producers will be met in as satisfactory a manner as is the case in the disposal of butter and cheese. Providing that there was a steady and regular demand for the product this item, of course, would present no difficulty.

As to what the future of the milk-powder industry may mean to the dairy-farmers of New Zealand it is impossible at present to say—time alone will tell. For the present, however, it would seem advisable to await further developments before spending large sums of money to build and equip factories for the purpose, unless some guarantee of a permanent market at payable prices be assured.

It may be mentioned here that the Department has decided to send a member of the Dairy Division at an early date to the United States and Canada, for the purpose of acquiring first-hand information regarding the preparation of milk-products, such as milk-powder and sugar of milk.

BUSH-SICKNESS INVESTIGATION.

EXPERIMENTAL work in connection with this dietetic trouble is being continued at the Mamaku Farm, and further information regarding the methods of treatment has been acquired. While the value of phosphatic manures as a means of combating the trouble has been further emphasized, it is evident that these alone are not sufficient to completely overcome the trouble, though they certainly enhance the grazing-value of the land to which they are applied to a very great extent, and enable cattle and sheep to remain in normal health for a considerably longer period than would be the case with animals grazed on land not top-dressed. Experimental work on new lines is being undertaken, but it is regretted that pressure of work in other directions has to some extent debarred the investigation work being carried out so closely and thoroughly as would be possible under normal conditions. The results of the general farming operations on the Mamaku Farm, apart from experiments, have been satisfactory from a financial standpoint.—*Annual Report of Live-stock Division, 1917–18.*

CO-OPERATION, CENTRAL PACKING, AND COOL STORAGE IN THE FRUIT INDUSTRY.

By J. A. CAMPBELL, Assistant Director of the Horticulture Division, and G. ESAM, Orchard Instructor.

ONLY the fruitgrower and those associated with him can fully appreciate the many problems and difficulties that affect the fruit industry. These problems mainly arise (1) from the perishable nature of the product and its liability to serious deterioration through rough handling in transit; (2) the weight and size of the package and the consequent high charges thereon as compared with the market value of the contents; and (3) the necessity of finding new markets and methods for the satisfactory disposal of the crop when production is in excess of the existing demand.

The first factor, apart from the establishment of fruit-preserving and other by-product works, improved storage, &c., suggests *care*—care throughout, from the time the fruit is formed on the tree until it reaches the consumer. In this connection, however, the grower, while endeavouring to induce carters, shipping companies, wharf lumpers, railwaymen, &c., to handle the fruit as it ought to be handled, should put his own house in order by improving his methods and setting an example beyond criticism.

The second factor suggests *economy*—economy in avoiding unnecessary cartage, freight, and wharfage charges by shipping as directly as possible to the consumer, and endeavouring, where necessary, to have transport facilities and all charges in connection therewith kept within reasonable limits.

The third factor suggests *co-operation and organization*. To push the sale of fruit successfully beyond the ordinary channels of trade, or to develop a successful export business, reliable packing under uniform standards is necessary, and no doubt this can be more satisfactorily accomplished under the central packing system than in any other way.

Care, economy, and organization with reliability added should thus become the watchwords of the fruitgrower, for with each feature strictly exercised the fruit industry should continue to develop on lines satisfactory to the grower and country alike. On the other hand, so will the difficulties confronting the industry develop in accordance with the extent to which the whole or any portion of these essential features is neglected.

CENTRAL PACKING AND POOLING.

In this country we have several different classes of fruit companies operating: The proprietary company, the semi-co-operative company working on proprietary lines, and the strictly co-operative company handling fruit on behalf of the grower on the commission basis. The majority of these concerns have either central packing or cool storage

facilities, or both. The pooling system, so highly spoken of in America, although not altogether new to this country, has not been given a fair trial here under modern methods. In the writers' opinion this system, if carried out on sufficiently broad lines and in combination with central packing and similar facilities, easily affords the greatest possibilities for the successful conduct of a co-operative fruit business.

The principal object of a fruit-trading company is to effectually handle the business of the company at a minimum of cost and labour. One of the heaviest items in connection with our present system is the keeping of the books up to date, owing to the large number of grades, varieties, markets, and growers that are concerned. Another item of importance is the demand on ordinary storage space during the season.

The common practice of handling fruit at these stores is as follows: The grower brings along a load of fruit. This is received by the storeman and weighed, merely as a check. The fruit is then stacked in the store awaiting sorting, grading, and packing. After this has been completed the number of cases of firsts, seconds, thirds, rejects, &c., roughly corresponding with the check-weight previously given, are credited to the grower. If the company has purchased the fruit from the grower it is then taken over; its subsequent history is a matter for the company alone, and is very much simplified. But if the company merely handles the fruit on behalf of the grower a check must be kept on the fruit until it has been finally disposed of. This applies to each grower's fruit as well as to each variety and grade. In either case, however, this system entails "cleaning up" after each separate lot of fruit has been graded and packed, and consequent dislocation of the work of the packing staff during the process. In the meantime other growers are arriving with fruit, and the same process of weighing and separate stacking goes on, with the result that floor-space is liable to become impossibly congested, particularly in the busy season.

Under a limited pooling system the same process would operate, and little advantage would be gained other than in reducing book-keeping and simplifying the disposal of the fruit after packing But under a wider scheme of pooling, such as that described in "Better Fruit," for September, 1918, if found to be practicable, many of the difficulties of co-operative fruit trading would be removed.

Roughly this system provides for 5 per cent. of the load being taken up by the storeman—"one box for largest size, one for smallest size, one for best colour, one for poorest colour, and the balance a fair average. These boxes are placed together in the space provided in the packing-shed where sampling is done. Here the apples are placed in special boxes and weighed to get the net weight of the fruit, and sorted and sized, and each grade and size break-weighed accordingly. These weights are entered on a sample-test ticket, which shows grower's name, variety, loose fruit receipt, number of picking-boxes, weight of boxes included, weight of boxes and net weight, the net weight of different sizes in different grades, and the weight of culls in sample test." It is on the result of this sample test that the grower receives credit for his fruit. This system of pooling applies to each variety and operates for the whole of the season. This method has the added advantage of doing away with the separate stacking of each grower's

fruit in the store, and as there would be no separate lots of fruit to pack there would be little or no interruption of the work of the packing staff.

But whatever system of trading a fruit company may adopt the popular and progressive practice of central packing will surely be maintained. In connection with central packing, however, the orchardist owes a very important duty to his company. No manager of a company can possibly build up and maintain a reputable name for his concern unless he has fruit of high quality to work upon, and the higher the percentage of this class of fruit available the better. As in the near future the fruit will be bought wholly on quality, it is for the grower, both in his own interests as well as in those of his company, to do all that he can to improve the standard of the fruit of his orchard, and, above all things, to carefully pick and deliver his fruit to the packing-house, when required, in as perfect a condition as possible.

The main questions to be considered in delivering fruit to the packing-house are the distance the fruit has to be carted, the nature of the roads, and the class of vehicle used. Fruit for delivery in this way is loosely packed in open cases. The insides of the cases should be even and smooth, preferably padded, but on no account should they be made of rough or broken timber. Neither should light loads be placed on strong-springed vehicles and then taken at a trot over more or less rough roads to the packing-house. The vehicle should be loaded according to the strength of springs with which it is fitted, and taken to the packing-house at a pace likely to cause the least amount of jolting. The object is to land the fruit at its destination minus bruise or stem-puncture, otherwise the packing standard of the company is sure to be detrimentally affected. Stem-punctured fruit is very difficult to entirely sort out of a consignment, and if it is packed the small wounds form ideal openings for the entry of Glomerella and Monilia rots.

COOL STORAGE OF FRUIT.

As a result of the war oversea markets have not been available to the fruitgrower of this country for some time past, and the local market has been called upon to absorb not only an amount of fruit equal to that previously exported, but also the increased production of our orchards, which has been considerable. These conditions have brought the necessity of cool storage very prominently under consideration. In many instances growers have risen to the occasion and formed companies which have erected cool stores and central packing-sheds. This has assisted very materially in the marketing problem and contributed largely, particularly in Hawke's Bay, to the satisfactory position of the grower. There is no doubt that without the increased storage space the situation financially would have been very much worse. During the past two seasons cool storage has been the backbone of the industry. It has extended the natural season, and by holding a large portion of the crop at picking-time has avoided large gluts. By this means better average prices to the producer have resulted, and at the same time by largely eliminating waste it should mean a lower average price to the consumer.

Up till quite recently the local market absorbed fairly well at picking-time all the fruit produced in the country. With the marked increase in acreage annually coming into bearing the position of individual marketing of the crop is now changed. The grower no doubt realizes that now the market will take only a limited supply of his crop at picking-time. The balance must be held in good condition beyond its natural season and marketed later. The longer the present conditions last the more growers will realize this fact. Unity is strength, and growers should therefore support the existing cool stores and distributing companies. Production has so increased that these are now essential to the grower, whose position, we venture to state, would be unenviable without their aid and co-operation.

Functions of Cool Storage.

Fruit is a living organism. From the time the flower is fertilized and the young fruit formed it gradually develops until it attains its maximum size. When this stage is reached fruit is generally known as matured. Expansion then ceases, but changes which are most important in connection with cool storage still go on within the apple. These are chemical changes known as ripening. When a fruit is fully grown it will ripen almost as well off the tree as on it, which indicates that the ripening process is peculiar to the fruit itself and quite independent of the other functions of the tree. Fruits ripen more quickly off the tree than on it, but with a few exceptions the flavour is detrimentally affected.

The function of cool storage is to retard the ripening process. It still goes on, but at a very much slower rate, and would cease if the fruit-juices were frozen. Freezing, however, would destroy the organisms causing the ripening change, and the cells would collapse and decay rapidly when brought to a higher temperature. The lower the temperature, provided the fruit-juices are not frozen, the slower the ripening process goes on. This is the guide for cool storage, hence for long storage the lowest chilling temperature should be employed. This is not so necessary for short storage, nevertheless it is advisable. Failure to reduce the temperature low enough is often the cause of faulty storage.

Fruit can be cool-stored only a limited time. This depends on the variety; some ripen much more quickly than others, whether in cool store or not. Fruit is at its best when fully ripe, or, in other words, when it is crisp and juicy and its maximum sweetness has developed. From this onwards it is apt to become dry and mealy, and when this latter stage is reached it is stored beyond its season. With both apples and pears it is probable that loss of quality in storage can very often be attributed to holding the fruit too long—that is, beyond its ripe stage. The same changes take place in fruit that is not stored; it also loses its quality and flavour after it is kept a certain time. Is it not better to sell on a lower market rather than hold the fruit beyond its best? If the quality is right the fruit will always sell.

Temperatures.

The maintenance of an even temperature should be the ideal of every cool-store management. Fluctuations in the temperature, par-

ticularly when they are marked, are very detrimental to the keeping qualities of fruit. As already indicated, for long storage the temperature should be as low as practicable. From 32° to 33° F. is suitable for apples, while pears are best kept a little cooler from 31° to 32° F. In each instance the lower of the temperatures mentioned is the most desirable. Possibly two to three degrees higher than these temperatures will do the work equally satisfactorily if the fruit is stored only for a few weeks.

Pre-cooling.

This is a matter to which many stores, especially in the warmer parts of the Dominion, could with advantage give more consideration. Personally, we decidedly favour pre-cooling, and consider it essential to successful cool storage. It is well known that the early and mid-season fruits will not keep as well in cool store as the later varieties. Anything that will improve the storing condition of the former sorts is worthy of consideration. The weather conditions and the period of the season in which the fruit is picked have a direct bearing on the matter. The hotter the day the warmer the fruit—the colder the day the cooler the fruit. This applies whether the fruit is on the trees or picked ready for storage. The early varieties are picked in the hotter months, and the fruit is correspondingly warm. When cases are filled they should not be left in the sun a moment longer than is absolutely unavoidable, but be placed in a cool shed till carted to the cool store. The greater the number of cases that are put direct into the storage-room at one time the hotter the air becomes in the room. This immediately causes an undesirable fluctuation in the temperature.

Now, on the other hand, suppose the same amount of fruit was put into a pre-cooling room for at least twenty-four hours and the heat taken out of it. The pre-cooler could even be reduced to the temperature of the permanent storage chamber. When cooled sufficiently the fruit is then put into the latter room. Under this method there is, comparatively speaking, no change in temperature by the introduction of new fruit into the storage-room. In both theory and practice the advantage is with the pre-cooler. The pre-cooler is usually of small capacity, with direct communication with the storage-rooms, and is fitted with a battery quite independent of the main rooms. This enables the temperature to be brought down quickly, but not so hurriedly as to cause withering of the fruit. These remarks will show the desirability of pre-cooling with the early and midseason fruits, which are always picked in more or less hot weather, but the system is also advantageous with the later fruits picked in cooler weather.

Air-circulation.

The fruit cool stores in New Zealand that the writers have had the opportunity of examining all adopt the system of cold-air circulation, but two distinct methods are in operation. The usual method is to have both the delivery and discharge trunks situated close to the ceiling. Sometimes they are at the extreme ends of the rooms, and sometimes along the sides. A power-driven fan forces the air over the battery coils and along these trunks into the rooms. The cold air then filters through the room and finds its way out of the trunk on the opposite side. In rooms of this description two forces are at work

aiding circulation, one being the mechanical action of the fan, and the other the natural downward movement of the cold air falling towards the bottom. With this method the trunks along the sides of the room offer an advantage over those situated at the ends. More openings can be made in the former, which gives a less volume of air entering at each aperture. At the same time, as the air has a shorter distance to travel, it sets up a more even and gentle circulation. This is a point that should be considered, as excessive circulation is very often the cause of shrivelling of fruit.

The other method of air-circulation is an innovation quite distinct from the foregoing. In this a false floor is provided which has small apertures at regular intervals over the whole surface. The cold air is driven by means of a fan through a trunk which runs along the floor the whole length of the room. This trunk distributes the air under the floor and it enters the room through the vents. As the air is forced into the room it must find an outlet. This is through vents in a false ceiling or through a trunk, which usually runs down the middle of the room. In theory this circulation is almost uniform over the whole floor of the room. It not only seems right in theory, but also works admirably in practice.

The amount and intensity of circulation can be adjusted mechanically by either cutting off or allowing more air to enter the room. This will largely depend on its degree of coldness. The correct circulation must be judged by results in each individual chamber.

Ventilation.

Cool-storage rooms for fruit require just as much ventilation as ordinary fruit-storage rooms, particularly during the early periods of storage, but the method is different. Fruit, as stated previously, is a living organism. One of its natural functions is transpiration—that is, it absorbs oxygen from the air and gives off carbon dioxide, commonly called carbonic-acid gas. Transpiration goes on continuously, being proportionately slower as the temperature is reduced. The same air is circulating continuously over the battery-room coils and through the storage-rooms. In time it becomes heavily charged with carbon dioxide thrown off by the fruit. This is largely responsible for the heaviness detectable in many rooms. To do justice to the fruit this air should be changed repeatedly, and thereby kept sweet. Many of the recently built stores have made provision for recharging the rooms with fresh air. In these the hot-air trunk is so arranged that the air can at any time be taken out of the room. Cold air can be drawn in from the outside through another opening. To get the best results the latter should be so arranged that the air goes over the battery coils before entering the storage-room. This will then avoid any great fluctuation in the temperature, particularly if it is done on a frosty night.

Stacking in Store.

Care and method adopted in stacking has a very direct bearing on success, and too much attention cannot be given to this work. It should be so arranged that the air has free circulation round at least two sides of the case, so that the cold will readily diffuse into the middle of the fruit. Slats placed between the cases facilitate air-circulation. The slats should be placed in the same direction as the

air-current, avoiding any transverse obstruction. The tiers of cases should barely touch. With the false-floor method of circulation slats do not appear to be essential; in these chambers we have seen excellent results when no slats were used except on the floor.

The official standard cases lend themselves well to stacking. They will sit squarely and firmly on the narrow side. No weight is then placed on the bulge. With these cases good results were noted in one store without the aid of slats. They were stacked on the narrow side with a full half-inch of space between each tier, care being taken that the openings were directly opposite each other for the whole length of the room.

Picking and Handling.

This has a very great influence on the behaviour of fruit in cool storage. Many failures can be directly traced to faulty picking and rough handling. Apples differ in size and maturity in relation to their position on the tree. The fruit when picked should be fully grown and matured, and the colour well developed according to the variety. Leave all stems intact on the fruit. On rapidly growing young trees on which the fruit is likely to be overgrown it may be advisable to pick a little earlier. On some lands fruit from young trees is very unsatisfactory in cool store. Pick over the tree several times, selecting only those fruits that are up to the requisite standard. Sun is beneficial to fruit while it is on the tree, but detrimental after it is severed, hence the necessity of keeping it in shade or covered once it is picked. Apples develop their best flavour when picked on a dry day after the dew is off the fruit and while the sun is shining. Avoid picking fruit when it is wet. Store as quickly as possible after picking; the keeping-qualities are seriously injured by delays between the orchard and store, and this is especially true in hot weather. The ideal is reached when the fruit is taken direct from the tree to the cool store.

The handling of fruit should have every consideration and attention. It should be carefully handled during the process of severing from the tree and placing into the picking-bag and receiving-case, and even after it is cased up. Bruising leads to premature decay, and everything possible should be done to reduce it to a minimum.

The stage at which pears are picked has a more direct bearing on the texture, flavour, and keeping qualities of the fruit than in the case of apples. Pears ripen much more rapidly after picking than they do in a similar temperature hanging on the tree. Pick the fruit before full maturity is reached. This stage is a matter of judgment; the stems should part readily from the trees; the pips are another indication—Williams particularly are fit for picking when the pips turn brown. As with apples, the trees should be picked over several times.

Packages and Packing for Storage.

On this aspect of cool storage there is possibly a very wide diversion of opinion. It is a matter of very great importance, and should be discussed. In selecting a package for storage it is well to remember that the larger the bulk of fruit and the more it is protected from the air the longer it retains heat. The type of package is not so important with the late-keeping varieties as it is with the quicker-ripening earlier sorts. The ordinary bushel case is about the maximum size that is

advisable with the latter, and is all the better when it is not too closely boarded. The smaller the package the quicker the fruit cools.

There is much to be said for and against grading and packing before storage, as against storing the fruit in bulk as it is received from the orchardist and grading and packing as it comes out of the store. For local market we think the latter method preferable. It certainly has the disadvantage of being extravagant with space, as fruit does not take up the same amount of room when graded and packed. This disadvantage is perhaps more than compensated for by the fruit going direct in cool store, instead of being held out of store for some time for grading and packing. In the height of the season the latter method sometimes leads to serious delays. Grading before storage is good, but marketing direct out of storage is risky; particularly if the fruit has not been stored till six weeks or more after being packed. No matter how careful the grader is a few defects are always liable to develop in storage, and even one or two faulty fruits in a case spoils its appearance. There is more certainty that the customer will get a first-class sample when it is packed after storage.

For long storage prior grading is most desirable. There is far too much space taken up with inferior fruit. All the blemished and undersized fruit should be taken out of the line before it is stored.

The Doncaster System.

Under this system each individual shareholder is entitled to so-much space in the cool store according to the number of shares he holds. The shareholder does all the work required in the store, such as handling and stacking, this being carried out according to the requirement of the engineers, whose salary is the only labour expense incurred. A room is provided for repacking. All the expenses are pooled and a proportionate levy made per share. The system has been in operation in one store in the Dominion for two years, and works admirably. The expenses run out about 1s. 6d. per case-space per annum. Against this the shareholder must place his time in connection with his part of the scheme. Each shareholder has to look after his own fruit and market it when he thinks fit. This individual marketing seems to be the great disadvantage of the system.

COOL-STORAGE EXPERIMENTS BY THE DEPARTMENT.

Cool-storage space has now been supplied in New Zealand for close on 250,000 bushels of fruit, nearly half of which was provided in the past season. To assist the orchardists and the cool-store companies to improve their working practices the Department is undertaking extensive experiments this season. Fruit will be picked in various stages of ripeness from the same trees. A comprehensive handling test is included in the scheme. Fruit will be packed in the orchard as well as in the central packing-shed. Part will be placed in store immediately after picking, while part will be kept in the orchard or store for various periods before being stored. Wrapping against non-wrapping will also be tried. It is proposed to use the following varieties in the experiment this season: Apples—Gravenstein, Cox's Orange, Jonathan, Munroe's Favourite, Lord Wolseley, Sturmer, and Dougherty; pears—Williams, Louise Bonne of Jersey, Winter Cole, and Winter Nelis.

CONCRETE FENCING-POSTS.

By H. G. GROVES "Marangai," Masterton.

In many of the earlier-settled parts of the Dominion the renewing of fencing-posts is becoming a serious problem. The native timbers have practically disappeared in some districts, and as yet comparatively little planting of trees suitable for producing fencing-timber has been carried out. Two materials suggest themselves for filling the gap—namely, iron and concrete. At the present time iron is out of the question, and it is doubtful whether it will be procurable cheap enough for fencing purposes for many years to come. Fortunately, New Zealand has unlimited raw material available for the manufacture of cement, while suitable gravel for making concrete is also available in most districts. In these circumstances there is little doubt that concrete posts are going to be a great help in meeting fencing requirements. The writer has had considerable experience in making and handling concrete posts, and thinks that some practical points on the subject may be of assistance to many of his fellow-farmers who propose to adopt this material in their fencing.

Clean sharp gravel with plenty of sand in it is required for making concrete posts; the gravel should not be coarse; no stone in it should be larger than a walnut for good results. If the gravel is coarse it takes too much labour to work it into a good state of puddle in the moulds, and there are apt to be crevices left which weaken the post.

Make the mould 5 in. by 4 in. at the bottom, 4 in. by 4 in. at the top, and 6 ft. 3 in. long, inside measurement. Cut sides of mould 6 ft. 3¾ in. long, bottom end 8½ in. long, top end 7½ in. long; all timber to be 4 in. wide. Mortise sides into ends ⅜ in. deep, allowing 1 in. outside of the mortise each side of the mould; this saves splitting when nailing together. Use 1 in. timber for the ends; ¾ in. stuff will do for the sides; if 1 in. timber is used for the sides cut end pieces ½ in. longer than measurement given. Nail sides and ends together, lay on a board, tack a cleat on either side of the mould to hold it in position, and it is ready for use. One end of the mould should be only lightly nailed to the sides, so that it is easily knocked off for getting the post out of the mould. The timber should be planed smooth for the inside of the moulds. Wet the moulds before putting concrete in them.

Use five parts of gravel to one of cement for post-making. A bucket made from a benzine-tin makes a good measure; five buckets of gravel and one of cement make three posts and a little over. Turn over the gravel and cement twice in the dry state, then water and turn twice or more wet. A little extra time and labour taken in the mixing is worth the while in results obtained. Do not apply too much water to the mixture to start with; dampen, and then keep adding water as the turning proceeds, till the mixture is the consistency of porridge.

It is better to have the mixture a little too wet than on the dry side, as it is more easily puddled in the moulds and sets better. If the mixture is too wet the water in it comes to the top as it is being worked into the mould and runs over the sides, taking cement and fine sand with it, which means wasted strength. A few mixings will give the experience required to know when the mixture is about right. A bricklayer's trowel and a plasterer's float are all the tools required for working the concrete in the moulds; any handy man can make the float.

Put 2 in. of concrete in the mould and puddle well, using the float to pack it in tight, especially into the corners, then work the trowel along the sides and ends. Doing this works the fine material out to the sides and makes a smooth and even surface on the posts. For reinforcing now lay two wires cut the length of the mould on top of the concrete, and fill the mould a little overfull. Push two more wires into the concrete, puddle well, being particular to work the trowel along the sides and ends, then finish off by working the trowel along the top of the mould to remove surplus material. In place of the two last wires a piece of piping or an old fencing-standard makes good reinforcement.

For fixing the wires to the posts several methods may be used. First is the method of holes through the posts made by inserting small-sized pieces of piping. For a new fence on level ground this way would possibly be satisfactory, but on hilly fence-lines it would be impossible to pull the wires through the posts owing to the wires locking on the edge of the holes at the dips and rises. Another method is to put two wire loops in the concrete for each wire, and thread a piece of wire down from the top of the post to hold the wires in position. The time taken in making the loops is a great drawback to this method. A better way is to put two $6\frac{1}{4}$ in. by $\frac{3}{8}$ in. bolts into the posts, one 5 in. from the top, the other 3 in. above the ground-level, for the purpose of bolting a 4 in. by 2 in. batten to the post. This allows the wires to be stapled to the posts in the ordinary way. Most farmers nowadays cut their firewood by circular saw, and it is an easy matter to rip good battens out of old timber-posts suitable for bolting on the concrete posts. Put a saw-mark on the moulds where the bolts are to be put in, so that all posts have the bolts in the same position. By doing this the battens are interchangeable. The bolts should be pushed into the concrete the full depth of the mould, taking care to keep them upright and in the centre of the posts. They are best put in after the mould has been filled with concrete and smoothed off.

For posts to be used at dips in the fence-line and requiring a foot, make a hole near the bottom of the post by putting in a piece of 1 in. piping, taking this out two or three hours after the post is made, by turning the piping round and pulling gently at the same time. Extra wire should be put round the bottom of posts that are to be used for dips. It is doubtful if concrete posts will stand the strain of the wires in a heavy lift, but they do quite well for light places.

Do not take the posts out of the moulds for a month after making—wetting them occasionally during that time—and leave them six months to season before using.

A bag of cement makes seven posts and a little over, two bags of cement making fifteen posts. Cement at the time of writing costs 7s. per bag, to which must be added carriage according to locality. Bolts

cost 3d. each at the present time. Gravel and labour for mixing the concrete will cost at least another 6d., making the cost not less than 2s. per post.

It has been suggested that it would be better to make the posts in their permanent places, but the bother of getting the material, a floor for mixing it on, water, &c., to where the posts are wanted is a great drawback to this method. Moreover, each post made would need to be protected from stock for several months. Straining-posts, owing to their weight, might be made in this way.

The weight of concrete posts is their chief disadvantage—each post weighing about 130 lb.; but they can be used where haulage is easy, leaving any timber available for use on rough back lines.

Concrete posts will never be as satisfactory as timber posts, but until farmers take more active steps to grow suitable timber concrete posts will play a big part in keeping our fences in working-order.

SEED-TESTING NOTES.

THE BIRDSFOOT TREFOILS.

By E. BRUCE LEVY, Biological Laboratory.

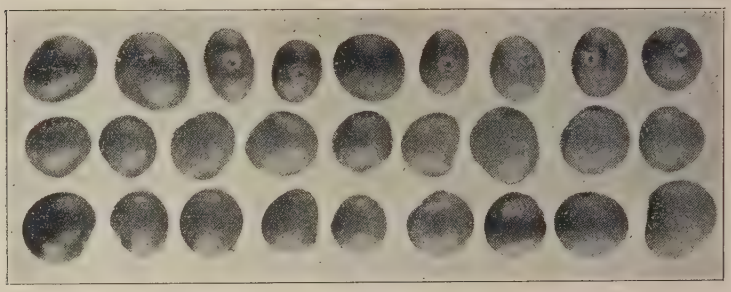
THERE are four species of birdsfoot trefoils of agricultural significance in New Zealand, and it has become custom, as in the case of the poas, to designate these by their botanical name—thus, Lotus major (greater birdsfoot trefoil), Lotus hispidus (hairy birdsfoot trefoil, or Boyd's clover), Lotus angustissimus (slender birdsfoot trefoil), and Lotus corniculatus (birdsfoot trefoil).

Lotus major and Lotus hispidus are fairly largely used, the amount of seed sown annually in New Zealand being approximately 10 tons to 15 tons of Lotus major and approximately 10 tons of Lotus hispidus. Not more than 2 cwt. of Lotus corniculatus is used. At one time the only lotus sown in New Zealand was Lotus corniculatus, but during the past ten years the amount sown has steadily decreased. Dr. Hilgendorf, in his "Pasture-plants and Pastures of New Zealand," strongly recommends the sowing of Lotus corniculatus on the light soils of Canterbury. It is probable that it would fill a very useful place on certain types of pasture-land, and experimental work on its real pastoral value should be carried out. Certainly a permanent clover that will grow vigorously in pastures on light dry land where the growth of white clover is small and intermittent is an urgent requirement on much of the rotation grass-land of the South Island.

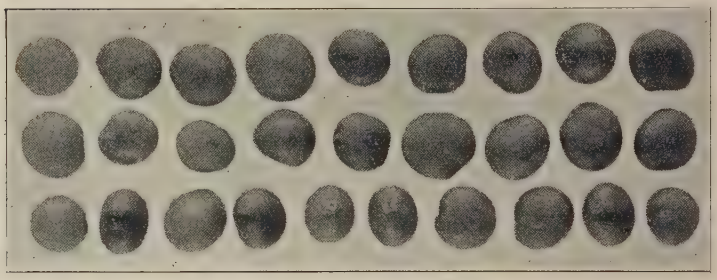
The seed of the true Lotus angustissimus is not on the market, although a little occurs as an impurity of Lotus hispidus. It is necessary here to point out that, as far as the New Zealand trade is concerned, the seed of Lotus hispidus and Lotus angustissimus is one and the same, and although sacks may be branded "hispidus" and "angustissimus" respectively, yet both lots will be one variety—namely, Lotus

hispidus ; or if two orders came in, one for hispidus and one for angustissimus, both would be supplied from the same seed, although not necessarily from the same sacks.

The early history of Lotus-hispidus-seed production in New Zealand is of some interest. The first seed was harvested in 1904 at Waikumete, near Auckland, by an old resident, Mr. W. Levy, who had been growing the plant for some five years previously, he having collected and sown a little seed from an orchard at Henderson, in which district the plant



LOTUS MAJOR.



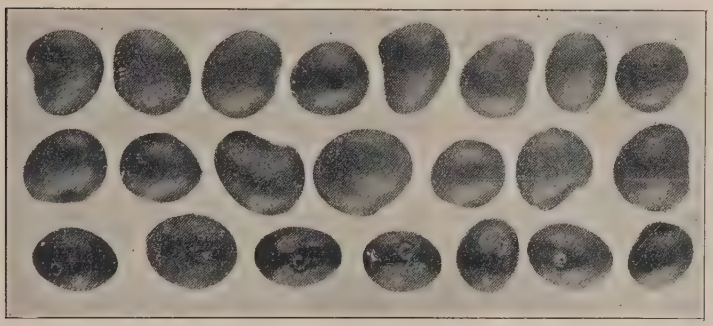
× 10 diameters. LOTUS HISPIDUS. [*Photos. by E. Bruce Levy.*

made its appearance some twenty-five years ago. The amount harvested was 10 lb., which was sold to a firm of Auckland seed-merchants, Messrs. Hesketh and Aitken, at 1s. per pound. The following year about 2 cwt. was harvested, and by 1911 the sale had increased to 3 tons. The price in 1910 was 1s. 6d. per pound, and in 1911 1s. 3d. per pound.

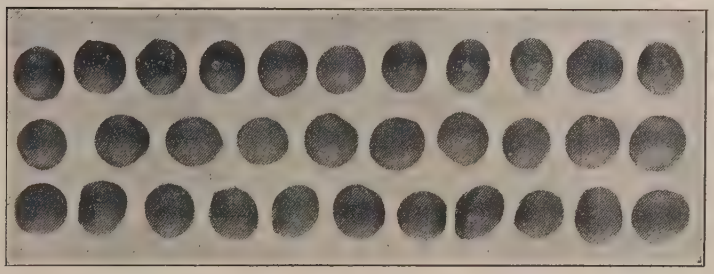
Up to this time the seed had been bought and sold as Lotus major. In 1912, however, the plant was identified by a local botanist as Lotus angustissimus, and thenceforward the seed was sold to the trade under this name. As has been pointed out, however, more recent investiga-

tions have shown that the plant was not Lotus angustissimus but Lotus hispidus, although Lotus angustissimus does occur generally throughout Lotus hispidus crops.

After 1912 the business passed to Messrs. W. P. Levy and A. A. Levy, who (up to the time the first-named brother enlisted for active service) were the principal producers of this seed. All the Lotus hispidus seed sold in New Zealand is produced locally, mainly throughout the Auckland Provincial District.



LOTUS CORNICULATUS.



× 10 diameters. LOTUS ANGUSTISSIMUS. [*Photos by E. Bruce Levy.*

Lotus major is saved for seed mainly in the Auckland Province, but prior to the war the greater portion was imported, mainly from Germany. This seed was exported from the latter country under the name of Lotus villosus or Lotus uliginosus, which names are the European trade names for the Lotus major of the New Zealand seed trade. Lotus major is very variable with regard to certain characters, such as hairiness, and in consequence several botanical names have been given to the plant. Lotus major Sm., Lotus uliginosus Schk., and Lotus villosus Cross & Germ. all refer to the one species. There are apparently a good many different strains, but whether or not these

breed true from seed and are good agricultural species, or whether they are due either to the habitat in which they are growing or to cross-fertilization, has not yet been ascertained.

What little Lotus corniculatus seed is sown is imported. The Auckland-grown Lotus major seed at present on the market is very unsatisfactory from a purity point of view, as the seed crops are almost invariably a mixture of Lotus major and Lotus hispidus, and as these two seeds are impossible of separation mixed lines are frequently met with. There is really no particular harm in sowing these two seeds mixed, for both plants do well in the same situations, although Lotus major prefers a wet or swampy habitat, and on such areas Lotus hispidus may be less desirable than Lotus major. Again, at the present time Lotus major is worth 4s. 6d. per pound, while Lotus hispidus is only 1s. 6d. per pound. In general, however, provided the price asked is commensurate with the purity analysis, there is really little objection to sowing these two seeds in a mixed condition.

It is to be deplored, however, that more systematic methods have not been adopted in the saving of such and similar seeds in New Zealand, for there is little doubt that seed-growing here could be raised to quite an important industry. This can only be attained when the seed crop is looked upon as a primary product, and not as a secondary product as at present, and when efficient methods are adopted in place of the loose unsystematic ones at present in vogue.

The following table shows the relative average germination-capacity and purity of the lotus-seeds as sold in New Zealand :—

Seed.	Average Germination Percentage.			Percentage of Hard Seed.	Percentage of Extraneous Seeds.
	Minimum.	Average.	Maximum.		
Lotus major ..	41·0	71·7	96·0	24·0	35·0
Lotus hispidus ..	31·0	60·4	83·0	21·0	1·6
Lotus corniculatus ..	12·0	51·0	71·0	31·0	4·0

The high average extraneous-seed content of Lotus major is due almost entirely to the presence of Lotus hispidus. One sample analysed contained 95 per cent., while others varied between 40 per cent. and 80 per cent. It will be noted from the analyses that the New Zealand seed-merchant is skilful enough not to sell the more expensive seed Lotus major in place of the less expensive Lotus hispidus, whereas Lotus major with a considerable amount of Lotus hispidus in it seems to find acceptance and to be passed on without many questions being asked. Generally speaking, when Lotus hispidus is not present the purity of Lotus major is fairly satisfactory. The sample, however, should be carefully examined for dodder. The impurity most frequently met with in Lotus corniculatus is rib-grass (*Plantago lanceolata*).

The identification of the seeds of these four lotus species can be well established with the aid of a pocket-lens magnifying ten to fifteen diameters. The key which follows, in conjunction with the botanical description of each seed, together with the photo-illustrations, should afford a ready means of identification.

Key to Identification of Individual Seeds of the Four Lotus Species.

1. Surface of seed speckled 2
1A. Surface of seed not speckled 3
2. Seed large; rich dark brown in colour; speckles a still darker brown .. *L. corniculatus.*
2A. Seed small; greenish-yellow to dark purple; speckles dark purple .. *L. hispidus.*
3. Seed uniform olive-green in colour .. .. *L. major.*
3A. Seed not olive-green in colour 4
4. Seeds brown in colour 5
4A. Seeds not brown in colour 6
5. Seed large; rich dark brown; hilum edge same colour as faces .. .. *L. corniculatus.*
5A. Seed small; hilum edge darker brown than faces .. *L. major* (see note).
6. Seeds uniformly purple-yellow to reddish-purple; surface of a very clean appearance .. .. *L. angustissimus.*
6A. Seeds yellow or greenish-yellow 7
7. Seed bearing a small fairly distinct protuberance on hilum edge .. *L. angustissimus.*
7A. Seed bearing no such protuberance .. .. *L. hispidus.*

NOTE.—Brown unspeckled seeds of Lotus hispidus also occur in samples that have been cut rather on the green side, but any brown seeds occurring in Lotus major samples are more likely to be Lotus major than Lotus hispidus, for the reason that Lotus hispidus ripens earlier than does Lotus major. Therefore any Lotus hispidus seeds in the Lotus major samples should be well matured—that is, unless wilful adulteration has been practised.

BOTANICAL DESCRIPTION OF LOTUS SEEDS.

Lotus major.

Size: Average length, 1·01 mm.; average width, 1 mm.

Shape: Somewhat conventionally heart-shaped, almost round; faces convex, although less so than edges; hilum edge flattened; hilum conspicuous as a little pit bordered by white margin.

Surface unspeckled; smooth, semi-mat with dull gloss, presenting almost a greasy appearance. Colour varies from olive-green to greenish-brown to brown, but individual seeds uniformly one colour.

Lotus hispidus.

Size: Average length, 1·1 mm.; average width, 0·94 mm.

Shape: Almost rounded; faces slightly less convex than edges; hilum edge very slightly flattened; hilum fairly well marked, but not quite so definite as in Lotus major.

Surface usually speckled; smooth, semi-mat with fairly bright gloss. Colour greenish-yellow, purplish-green, to dark purple; speckles dark purple. The amount of speckling appears to be a variety character, as the writer has produced an even yellow unmottled seed, and another with but very few and fine specks. Individual plants throw either speckled seed, slightly speckled seed, or purplish-coloured seeds.

Lotus corniculatus.

Size: Average length, 1·4 mm.; average width, 1·16 mm.

Shape: Fairly irregularly heart-shaped; somewhat rounded; at times elongated; faces convex, although less so than edges; hilum edge flattened, at times indented; hilum fairly conspicuous, but no very definite white circular margin.

Surface smooth; mat with dull gloss. Colour a fairly uniform rich dark brown, with still darker brown speckles; speckling slight, and in many seeds absent or not readily discernible.

Lotus angustissimus.

Size: Average length, 0·9 mm.; average width, 0·81 mm.

Shape: Almost rounded; faces slightly less convex than edges; hilum edge very slightly flattened; hilum fairly well marked, as in Lotus hispidus; a small, fairly distinct protuberance present on hilum edge.

Surface smooth; mat, with very slight gloss, presenting a very clean appearance. Colour uniformly yellow, purplish-yellow to purple, with no speckles.

AMERICAN STRAWBERRY VARIETIES.

UNDER TEST AT MOTUEKA.

By M. DAVEY, Orchard Inspector, Motueka.

THE writer recently had an opportunity of visiting the strawberry-beds of Mr. J. Edelsten, Hau, Motueka. Some three years ago Mr. Edelsten came to the conclusion that the varieties at that time being grown in the Nelson District did not possess all the qualities that were desirable to put strawberry-growing on the best paying basis. In view of this he imported a quantity of plants of those varieties most in favour in the United States of America, and since the planting season of 1916 he has been testing and recording the crops obtained from these plants.

The land on which the plants are growing is flat and rather light and stony. The rainfall in the locality is about 40 in. per annum. Small quantities of blood-and-bone manure have been used. The following varieties have proved of special merit:—

Chesapeake.—Late; bisexual. This is the most popular fancy strawberry on the American markets to-day, and Mr. Edelsten is under the impression it will maintain its high reputation if planted in Nelson. He has found it practically rustproof, free from spot, extra strong, and a good drought-resister owing to its deep-rooting habits. In view of the curtailed season last year, due to a dry spell, this should carry weight with growers. The berry has proved firm and therefore a good carrier, and is of high colour, with very conspicuous yellow seeds which greatly add to its beauty. It is not a heavy cropper, but sets a good crop carried over a long period. As indicated, it belongs to the bisexual class. This term is applied to those varieties which produce complete blossoms and are self-pollenizing. Those varieties which produce imperfect blossoms, and which require to be planted adjacent to perfect blossoming varieties will henceforth be termed in these notes "pistillate" varieties.

Klondyke.—Medium-early; bisexual. As a competitor with the well-known variety Melba, whose many good points Mr. Edelsten acknowledges, but which he considers too soft for market, he gives a preference to Klondyke. The plant is as strong as Melba, a very free runner, and beds up well. It is a strong grower on the poorest portion of his ground, and one of the earliest berries, fully three weeks ahead of Melba, which is considered a big item. The foliage is clean, and up to the present resistant; the fruit is of good colour, extra firm, and the flavour tip-top.

Haverland. — Midseason; pistillate. This variety has proved of conspicuous value. It is an extremely long berry of striking appearance, and exceptionally sweet, a feature which would appeal to a large section of consumers. Mr. Edelsten has found Haverland free from

leaf-spot or rust. Although the advantages of mulching are generally conceded by experienced strawberry-growers, the heavy-cropping habit of this variety makes the practice more urgently necessary if the best results are to be obtained.

Tennessee Prolific.—Midseason; bisexual. The berries are large and of good colour, and the crops have been extra heavy. The foliage is good, and the plant is an extremely free runner. This is a strawberry which has held its own in America for the last thirty years. Its good characteristics, Mr. Edelsten considers, are well maintained under Nelson conditions. From yearling plants he has realized a big return.

Ohio Boy.—Late season; bisexual. As an extra-late berry this variety was very highly recommended, Mr. Edelsten attaching special value to it for the purpose of extending the season and realizing late prices on the market. Ohio Boy has fruited with him from November to end of March. The cup or calyx remains green for a very long period after picking.

Wildwood.—Extra early; pistillate. As a variety eminently suitable for factory or local market use, Mr. Edelsten considers Wildwood as "out on its own." It is a vigorous grower, carries its fruit quite clear of the ground, is an abundant cropper, has an extra-bright colour, and fruits in uncommonly large clusters, thereby lending itself to very rapid picking.

Amanda.—Midseason; bisexual. Growers who receive a demand for extra-large fancy fruit will find that this variety has the necessary qualifications.

Helen Davis.—Midseason; bisexual. Mr. Edelsten considers this variety to be the heaviest cropper on the ground. It makes a strong growth, the berries hold up well after picking, and the cup or calyx remains bright and green for a long period. The berry in flesh is a little pale in colour, but the fruit is above medium in size and of good quality; it is a very consistent bearer.

Warren.—Midseason; bisexual. Mentioning the question of choicest quality dessert, my attention was called to this variety. Originated by Mr. S. H. Warren, of Massachusetts, who has been growing berries for fifty-eight years, it is generally accepted as the best of his productions. With dark-green foliage and of healthy habit, it appeared to have much to recommend it. Mr. Edelsten does not find it a free runner; but in consequence he finds the crop extends over a long period; he considers this variety demands a really good soil.

Other Varieties.—Other varieties grown, which are not satisfactory so far, but which Mr. Edelsten thinks would probably be of more value if grown on a heavier soil with more moisture and in a cooler climate, are as follows: *Gold Dollar, Handback Beauty, Bubach, Climax, Early Ozark, Model, Aroma,* and *Kellogg's Prize.* He has found the last named a magnificent berry, and is under the impression that it would be well worth attention under the conditions mentioned. A variety called *Myrtle* has proved so unsatisfactory that he has ceased to plant it.

As we passed off the ground my attention was drawn to the well-known and extensively planted variety, Royal Sovereign. While admitting its many good features, with regard to flavour, colour, and

general appearance, Mr. Edelsten states that he cannot overlook the fact that it is very subject to leaf-spot, and is in no way to be compared to many of his American varieties as a carrier.

Planting.—With regard to planting Mr. Edelsten prefers to plant those varieties which run freely 18 in. in the rows, and 3 ft. 6 in. between the rows, and he obtains early fruit from self-rooted runners. Those varieties which do not run freely he plants 10 in. in the rows, and 15 in. between the rows. He prefers the month of April for planting, so that the plants may have a good root-system before frosts appear.

DAIRYING IN FRIESLAND.

By Miss G. N. DAVIES, Cheese Instructress.

DAIRY-FARMING has been practised in Friesland from time immemorial. With an area of about 620,000 acres of excellent grassland, the Friesian cattle furnish the material for the butter and cheese of the province, which produce is always in great demand. No other breeds but black-and-white and red-and-white cattle are found in Friesland. Cattle are bred with a view to good appearance and high percentage of fat in the milk.

The quality and analysis of the milk of the cows, which number about 80,000, are determined by means of a fortnightly control by certificated controllers or testers. While about thirty years ago every farmer handled the milk of his own cattle, at the present time much of the butter and cheese making has been transferred to creameries and factories equipped in modern style and operated by qualified staffs. There are now about 125 butter and cheese factories in the province, and with a population of only a little over 260,000 inhabitants exportation is necessary. The average yield of milk per cow amounts to about 8,800 lb., and the total production is estimated at 14,732 tons of butter and 27,500 tons of cheese.

By far the greater number of dairy factories are controlled by the farmers themselves as co-operative concerns; some others are under the direction of companies and enterprising private people. Constant endeavours are made to prepare dairy-produce of finest quality; the value of good raw material is realized, and the farmers in general take great care in keeping the cattle clean and in the treatment of the milk. By means of milking competitions, lecturing, &c., everything is done to encourage good milking. Filters are often given gratuitously by the creameries to the suppliers, in order to obtain milk of the greatest cleanliness. The cows are milked twice daily, and the milk taken to the factories as soon as possible. At the factory a sample is taken from each consignment for testing for butter-fat, and payment is made accordingly. Samples are also taken immediately for examination as to the quality of the milk for manufacturing purposes, the fermentation test and cleanliness test, &c., being employed.

Training of dairy-factory managers takes place at the Government Dairy School at Bolsward. The General Netherland Dairy Association grants diplomas for cheesemakers, buttermakers, and centrifugists (separator operators).

BUTTERMAKING.

The milk which is to be separated is strained immediately after the weight has been noted and the required samples taken. It is then heated to 90° F., which temperature has been found most suitable. Part of the separated milk is taken back by the farmers for feeding purposes, and the remainder used for making cheese. The cream is pasteurized at a temperature of 175° F. to 185° F., and then cooled down to about 40° F. to 45° F. A low cooling-temperature is preferred, as the butter produced is firmer. The cooled cream is pumped into cream-ripening vats in which the temperature can be regulated. The butter is prepared from sour cream only, therefore pure culture starter is used. The cream is ripened at a temperature of from 52° F. to 60° F., and from 8 per cent. to 10 per cent. of starter is added. The cream takes about twenty hours in which to ripen, and during this period the temperature is carefully watched. As soon as the cream is ripe it is churned.

CHEESEMAKING.

A great part of the cheese-output of Friesland is made from partly skimmed milk, principally Edam shape. Immediately the milk is received at the factory it is cooled to a temperature of 40° to 50° F. It is then left to stand for eight hours in vats containing 550 gallons each. During that time the cream rises to the surface and the skim-milk is drawn off by means of a tap at the bottom of the basin, the cream being left behind. Milk can be brought to contain the desired percentage of fat by adding separated milk, whole milk, or cream. The milk is run into the cheese-vats where it is heated to from 77° to 90°. The temperature differs, according to the kind of cheese to be made, the percentage of fat in the milk, the season, weather, &c. A sample of milk is taken for estimating the percentage of fat. A pure culture starter is then added to the milk and well stirred in before adding the rennet. After coagulation takes place the purpose of the further operations is to get the moisture out of the curd, which is now called *wrongel*. This is done by cutting the curd and keeping it in motion. During all operations the degree of acidity in the whey is taken. The temperature of the contents of the vat is raised; this is not always the same, but varies, sometimes from 2° to 10°, according to the kind of cheese made, percentage of fat in milk, the nature of the curd, degree of acidity, &c.

When the curd is sufficiently dry the whey is run off and the curd filled into cheese-moulds. This has to be done very carefully in order to prevent flaws in the cheese; care has also to be taken in pressing. When taken from press the cheese are salted by floating them in brine, the temperature of which should not be over 60°. They are usually left in the brine-sinks for three to five days. During the brining the cheese are turned regularly every day and the surface sprinkled with salt. Great care is taken to prevent the surface of the cheese being in a draught. When they have absorbed sufficient salt they are left for one or two days to dry slowly in a room provided for that purpose.

Afterwards the cheese are placed in ripening-rooms, which at the same time serve as store-rooms.

In order that the cheese should ripen well the surroundings are made to comply with certain conditions concerning humidity and temperature. Of course, for old cheese the humidity may be greater than for fresh ones. The temperature maintained is moderate, from 54° to 60°; fresh cheese may be kept at a little higher temperature than older ones. The cheese are turned daily; a good rind is obtained by watering when the cheese are a few days old; later they are rewashed, and after that oiled and sometimes paraffined. Further care is taken of the rind by daily rubbing. The ripening-period depends on the particular variety and size of the cheese.

During the last few years a large quantity of Cheddar and Cheshire cheese has been made in Friesland. Their preparation is, of course, quite different from that of Gouda and Edam cheese. These cheese are either whole-milk or half-skim.

BUTTER AND CHEESE CONTROL.

Friesland, as already indicated, is bound to export a large part of its dairy-produce. It is generally recognized that in order to be able to export successfully it is indispensable that the produce should be of excellent quality and that the buyers should be given a guarantee as to the soundness and standard of the produce. The creameries in Friesland have joined a butter-control station established at Leeuwarden. All the butter made at the creameries has to bear the well-known Government mark, by which is warranted the non-adulteration of the produce and a percentage of water which amply satisfies the demands made abroad, all being founded on an analysis in the laboratory of the control station.

As we have seen, the various kinds of cheese made in Friesland are of very different standards. By the methods of skimming cheese can be made containing any percentage of fat. This opens the way for a less honest trade which in the end might do great harm to the industry, and for giving guarantees to buyers as to the standard of the produce a cheese-control station was also established at Leeuwarden in 1912. The cheese-control station supplies the makers with a mark for cheese with a percentage of fat in the dry substance of at least 45 per cent., and another for least 40 per cent. (these marks must not be placed on Cheddar, Cheshire, or any other English variety). Marks are also supplied for cheese with at least 30 per cent. and at least 20 per cent. fat in the dry matter.

NOTE.—The information contained in the foregoing notes was gleaned during a visit paid by the writer to Friesland while in Europe in 1915.

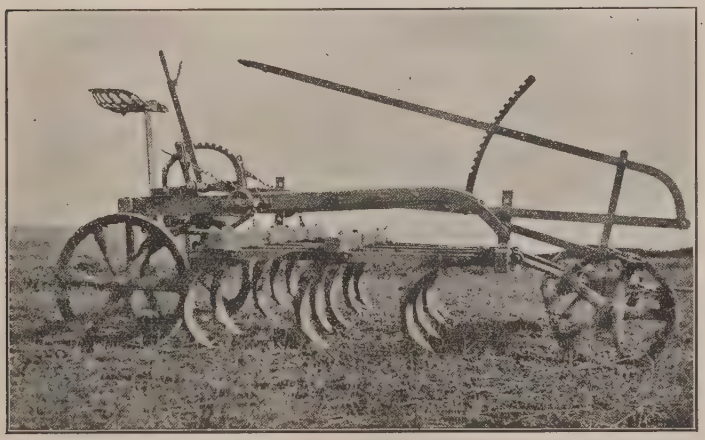
The seed of all the mangold varieties sown at Ruakura this spring was produced on the farm, the sample being excellent in each case.

Jersey breeders will be interested to learn that up to the middle of this month ten calves by Golden Swan had been dropped at Ruakura. Nine of these are heifers.

AN IMPROVED CULTIVATING IMPLEMENT.

It is always pleasing to notice inventions or improvements in agricultural machinery and implements originating in New Zealand—which has a fine record in this line—especially when the originator is a practical farmer. A recently produced implement falling under the category is an improved cultivator designed by Mr. Hugh S. McCully, of Waitohi, Temuka, and brought out under the name of "The Hustler" drag-harrow.

As will be seen by the accompanying photos, the cultivator is carried on four wheels, with a turning fore-carriage, and has a riding-seat.



THE "HUSTLER" CULTIVATOR.

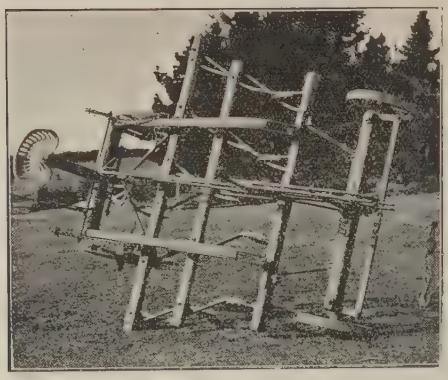
The tines are rigid and set in three rows, four in the first, five in the second, and six in the third. The whole principle of the arrangement of the tines is to produce a lateral moving action and selective tendency, so that any trash unable to pass between the set-off of the tines is discarded to the outside. In cultivating this method has the advantage over two-row cultivators in that the soil cut by the leading tines is not struck fair in the centre with the danger of dragging, but at the distance of the set-off of the next tine, and is solid until struck by the last tine. The machine thus exerts all available power to tear the sod to pieces.

On steep sidings satisfactory results have been obtained, the implement doing uniform work in either direction. Side-slip is eliminated by a patent hillside adjustment where necessary.

If desired, the outside rows of tines can be quickly removed and the machine put in to a depth limited only by tractive power. This plan suits for the first stroke, the seed bed being subsequently produced with all tines on. Tine points of various sizes can be fitted.

The "Hustler" is made in three sizes: 9-tine, 4 ft. 2 in. wide, for three horses; 15-tine, 6 ft. 9½ in. wide, for five or six horses; and 19- and 21-tine, 8 ft. 4 in., and 9 ft. 7 in. wide, for tractor haulage. In the latter sizes the levers are adjustable from the tractor-seat.

The implement is doing good work in South Canterbury, and is well reported on by the Department's Fields Supervisor at Timaru (Mr. H. T. Turner), who arranged a special trial. On this occasion the cultivator was first tried in a stubble paddock that had not been ploughed for over twelve months. This it broke up and scarified to a depth of 2 in., the ground then being cross-harrowed and left in splendid order, fit for sowing any catch-crop or grass. The next test was in a recently ploughed field, where one stroke of the "Hustler" did better work than two strokes of the disk harrow. In the same paddock it did excellent work among some couch and yarrow. Grubbing of turnips was also well performed. Mr. Turner was satisfied that in the "Hustler" had been produced a very useful all-round cultivating implement, which would to some extent take the place of the disk harrow.



VIEW OF PLANE OF IMPLEMENT.

The implement is being manufactured at Timaru.

Grading of Fruit-trees—Regulations governing the grading of fruit-trees for sale from nurseries were gazetted on 21st November. The regulations embody the scheme drawn up by a committee of the Nurserymen's Association and the Department, particulars of which were given in the *Journal* for May last.

Foot-and-mouth Disease in England.—The Department has been officially advised of an outbreak of foot-and-mouth disease in East Sussex, and that an order had been made prohibiting the movement of animals in a large area surrounding the seat of infection. It is understood that at the date of the advice the disease was confined to one farm, but investigations as to its full extent were then not completed. In the meantime no shipments of cattle, sheep, or pigs will be permitted from England to New Zealand. The last officially confirmed outbreak in Britain—one of short duration—occurred early in 1916.

GERMINATION OF VEGETABLE-SEEDS AND GARDEN CULTIVATION.

By W. H. TAYLOR, Horticulturist.

A NUMBER of requests have been made by garden cultivators for information regarding the average time taken by vegetable seeds to germinate. I must say at the outset that I approach the subject with a good deal of diffidence. There are many factors that influence the germination of seeds, such as the temperature of the soil, the character of the soil, weather, depth of sowing, and age of seed. Quite fresh seeds germinate in a shorter time than do seeds that are a year or more old, though the older seeds may have equally good germinating-powers. Small seeds—carrots for instance—that are covered with half an inch of soil will take longer to break through than those put in at half that depth. In spring-time a cold spell, which often occurs, may delay germination. In summer a dry spell after sowing may have a like effect—in fact summer drought is more potent in its effect than wet weather in spring. It is largely a matter of soil. In spring-time the colour of the soil has effect; black soil absorbs heat, light-coloured soil reflects heat; therefore a soil well supplied with humus, other things being equal, would germinate seeds quicker than a clayey soil. Taking all these things into consideration, it must be obvious that it is impossible to say how many days in all conditions seeds should be showing through the surface, nor how long it is possible for them to remain in the soil without perishing.

Complaints are often heard that seedsmen supply bad seed. I am quite certain that the complaint is unwarranted, at any rate as far as respectable firms are concerned. It would not pay. Few people have had more experience than myself, and I can say that a bad packet of seed has never come into my possession. A large proportion of the seeds we use are imported. These seeds are artificially dried to enable them to pass through the tropics. The seeds are quite good on arrival, but they may not be good a year later; so that if a portion of the seeds is kept over for another season they may fail to grow. The moral is buy only the quantity you require, and if there is any surplus throw it away.

The preparation of the soil has great influence on the germination of seeds. Preparation includes what is put into it, and the way in which it is put in, as well as digging. Very often the soil is covered with weeds when digging is undertaken, or there may be the remnant of previous crops. The chances are great that among the weeds or crop-remnants numerous slugs or other vermin are sheltering. Dig these in and the odds are they will devour your seedlings, often before they are visible through the soil. Before digging a good dressing of air-slaked quicklime should be given, sufficient to search among the weeds and cover the surface of the soil. This will destroy slugs and

many of their eggs, and do much to banish other insects—wireworms, woodlice, &c. Cabbage and other similar stumps should not be dug into the top spit. They become hollow and provide congenial shelter for insect pests. Such stumps should be buried in the bottom when trenching is being done, or they may be burned.

Heaps of decayed vegetable matter, weeds, and garden refuse generally are sure to be infested with slugs, wireworms, woodlice, and grubs of various kinds unless precautions have been taken against them. Lime should be sprinkled on the heap when fresh stuff is added, and occasionally the heap should be turned over, removing for burning anything that will not rot, and giving a sprinkle of lime now and again while the heap is being turned. The effect of the lime will be to banish insect pests, to prevent the growth of fungus spores, and to add very materially to the fertilizing-value of the compost. It should be understood that lime used in the manner indicated does far more than destroy insect pests. It is a necessity in vegetable-culture, and if it were more freely used there would be less trouble with fungoid and other pests and a lessened loss from malnutrition diseases.

Stable manure is capable either of much good or a good deal of harm, according to whether it is properly prepared and used or otherwise. If it is in a dry littery state when dug in it may and probably will be a harbour for woodlice, unless it is well mixed with the soil. The common practice is to push a lot of it into the trench and cover it with the soil from the next spit. There is no harm done by placing layers of manure in the lower trenches, but if it is dry or very littery it will do harm under the top spit of soil. Apart from probable infestation by woodlice, dry manure in such a position will prevent capillary action during dry weather, and so deprive plants of moisture that should be drawn from the lower levels. It may also create a wet, soggy condition of soil during wet weather. Manure of a strawy nature should be well mixed with the soil. Manure of a heavier nature, or that which is free from much litter, should be well covered with soil—that is, it should be dug in deeply, so that a surface of clean soil well broken up can be secured for sowing the seeds.

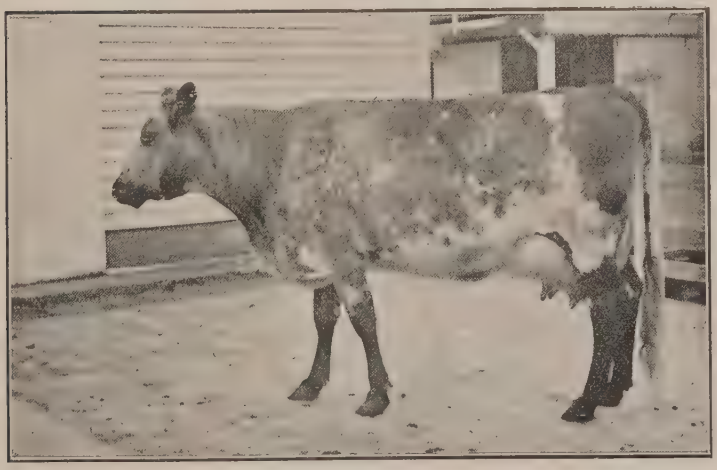
When green matter, such as lupins, mustard, or similar crops, is dug in, this should always be done several weeks before seeds are to be sown, so that the soil may settle down. Such crops should be turned under when soil-moisture is abundant, not during the dry season—unless the soil is to lie fallow till wet weather intervenes—for a considerable amount of soil-moisture is necessary to promote the decay of the crop turned under.

For the smaller seeds the soil should be fairly firm, so that the soil-particles lie close together, enabling the hair-like rootlets to obtain ready contact, and also to ensure the seeds remaining at the depth they were sown. When soil of a heavy nature is being dug care should be taken to break up the whole spit, not merely the surface. It is not sufficient to break up the surface by hitting it with the back of the spade, as that leaves most of the spit unbroken. The spit of soil should be cut up with the edge of the spade, the strokes being made in an upward direction. In most cases stiff soil is best dug with a flat-tined digging-fork. When soil with a surface of turf is being dug the turf

should first be cut off and placed in the trench, then the top spit can be broken up, which it is quite impossible to do with the turf on.

The soil being properly prepared, seed-sowing should be done only in fine weather and at suitable times. Drills should be carefully drawn at the proper depths, and the seed carefully covered. Drills for onions and carrots should be only just deep enough to enable the seeds to be covered. This will be about ½ in. below the surface, appearing to be at least double that depth with the little ridges of soil drawn out on each side. Peas and beans should be put in 3 in. under the surface; parsnip and spinach a little deeper than carrots and onions. Cabbage and similar seeds are frequently sown broadcast, and in that case only a proportion of the seeds come up; some get too deep, and some not deep enough, while others germinate on the surface and perish. If sown in drills ½ in. is deep enough for these seeds.

If all work in connection with vegetable-growing was carefully done on the lines indicated there would be little need to know how long seeds should be in germinating, particularly as none take very long when conditions are normal. Onions and leeks should show through in about twenty-one days, and carrots and parsnips in about the same time, probably a day or two less; cabbage, cauliflower, and others of that tribe in about ten days; spinach also in ten days; turnips in five or six days; celery in the third week; and peas and beans in about fourteen days. Other vegetable-seeds not mentioned are covered by these periods, three weeks being about the outside limit.



DINAH: RUAKURA MILKING-SHORTHORN HERD.

C.O.R. (1917) in mature class 10,993·80 lb. milk, 420·63 lb. butter-fat

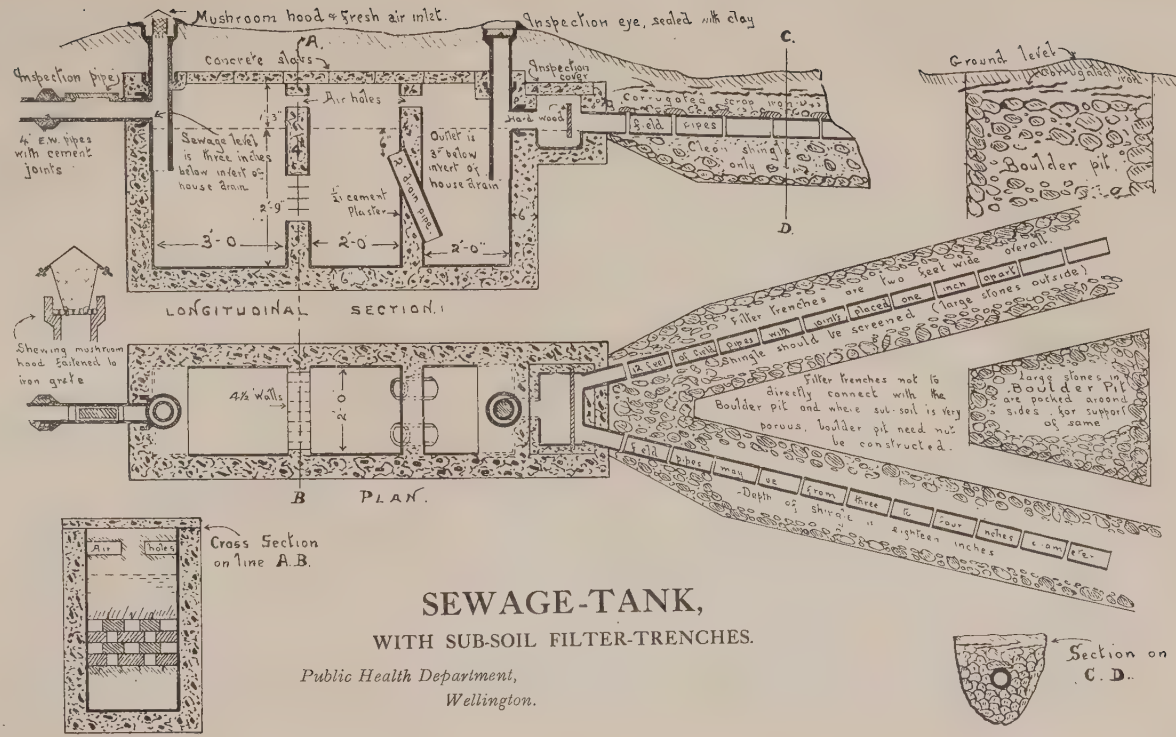
SEPTIC-TANKS.

MEASURES for the improvement of farmhouse sanitation, following closer settlement and an upward trend in rural domestic standards generally, commonly involve the installation of septic-tanks. In response to inquiries on the subject we reproduce herewith a standard rough plan suitable for an average dwelling, as issued by the Department of Public Health. That Department, however, stresses that it cannot take any responsibility for the outcome of an installation constructed in accordance with the plan, unless a prior inspection has been made by one of its officers of the site on which the tank is proposed to be installed, and careful inquiry made into the available method of disposal for the effluent, also as to the water-supply for the house.

The Public Works Department supplies the following note on septic-tank construction (which does not refer directly to the standard plan) :—

"A septic-tank should be of sufficient capacity to hold at least 20 gallons per head per diem. It should not be deeper than 5 ft.—that is, to hold, say, 3 ft. 6 in. of liquid in depth. There is only one chamber in a septic-tank, as a rule, but it is advisable to have baffle cross-partitions (not in line vertically) to prevent a lodging of sediment at the outlet end which may have a tendency to choke the outlet. It is, where practicable, advisable also to provide an aerating-bed composed of boulders of varying dimensions and about 3 ft. to 4 ft. deep, open to the air on top and sides, to receive the discharge, which should percolate through the joints of field drainpipes laid on top of the boulder bed. This aeration is valuable in reducing the offensiveness of the effluent, but if the sewage be conveyed to discharge over cultivated land the aerating may be dispensed with. It must be remembered that the effluent from a septic-tank without aeration is still sewage with all its offensiveness, excepting that it is liquefied. The above description is a general one only, but a drawing showing construction details is necessary for each particular tank and site."

Sheep-maggot Flies.—Since there is still some doubt as to which species of blow-fly is mostly responsible for blowing sheep, and whether one species does the damage in one district and not in another, it is desirable in order to clear up this question that living specimens of maggots from blown sheep be procured from all parts of the Dominion. Sheepowners willing to assist are asked to kindly forward living specimens to "The Biologist, Central Development Farm, Weraroa." Specimens are best sent in a tin containing damp oatmeal. A note should be enclosed stating whether the maggots are from wool, feet, or horn-cavities, together with date of capture, locality, and any remarks on the extent of damage done in the district.


Mushroom hood & fresh air inlet.
Inspection eye, sealed with clay
A.
C.
Concrete slabs
Inspection pipe
Inspection cover
Air holes
Corrugated scrap iron cover
Hard wood
Field pipes
Clean shingle only
4" E.W. pipes with cement joints
Sewage level is three inches below invert of house drain
Outlet is 3" below invert of house drain
4" drain pipe
½" cement Plaster
2'-9"
3'-0
2'-0
2'-0"
D.
Ground level
Boulder pit.
LONGITUDINAL SECTION.
Shewing mushroom hood fastened to iron grate
4½ Walls
Filter trenches are two feet wide overall.
Filter trenches should be screened with clean shingle placed one inch apart
at least of coke gives
Filter trenches not to directly connect with the Boulder pit and where sub-soil is very porous, boulder pit need not be constructed.
Large stones of Boulder Pit are packed around sides for support of same
Field pipes may be from three to four inches diam. etc.
Depth of shingle is eighteen inches
B
PLAN.
Air holes
Cross Section on line A.B.
Section on C.D.

SEWAGE-TANK,

WITH SUB-SOIL FILTER-TRENCHES.

Public Health Department,
Wellington.

ORCHARD COVER-CROP EXPERIMENTS ON THE MOUTERE HILLS.

By W. C. HYDE, Orchard Instructor, Nelson.

A THIRD annual experiment in orchard cover-cropping was carried out this year by the Mahana Fruitgrowers' Association in co-operation with the Horticulture Division, at Bronte, Moutere Hills, Nelson. Details of the original scheme and notes on the results of the first and second years' operations were published in the *Journal* for December, 1916 and 1917, respectively.

The crops tested on this occasion were ryecorn, Algerian oats, Cape barley, Ruakura oats, partridge peas, Scotch vetches, horse-beans, and Lotus angustissimus. The latter was drilled in at the rate of 20 lb. of seed to the acre; other crops were sown at the rate of 2 bushels to 2½ bushels per acre.

The manure used was that of No. 4 in the 1916 experiment, and which proved so successful on that occasion—namely, blood-and-bone and superphosphate, 1½ cwt. of each to the acre. In the experiment now under review the mixed manure was applied at the rate of 2½ cwt. per acre. Unfortunately lime, which proved to be so indispensable in 1916, could not be obtained in time for this experiment.

The seed was drilled in on 12th and 13th March, the land being in first-rate condition. The winter was exceptionally cold and wet—a bad season for grass and cover-crops generally. When inspected in early winter it was found that all seeds had germinated freely, and the crops looked well. Before spring ploughing, towards the end of October, the crops were again inspected, and the following conditions noted:—

Partridge peas: A few plants 6 in. high; tips green; most plants had withered off.

Ruakura oats: No rust; average height 15 in.; in ear; uneven; good colour. Where cross-drilled with vetches the latter averaged 1 ft. in height, with good colour and moderate take.

Cape barley: Straggling plants a few inches high; of no practical value.

Algerian oats: Average height 18 in.; colour good; just coming into ear; no rust; quite the best crop on the plot.

Ryecorn: Average 1 ft. high; in ear; good colour; patchy; worth another trial.

Scotch vetch: Average height 7 in.; poor colour; an excellent take, and the plants withstood the frost.

Horse-beans: They had been a good take, and came away well, but the majority of the plants withered off when about 6 in. high.

Lotus angustissimus: An excellent strike of seed, but with the exception of stooling out a little very little growth had been made.

It will be noted that while all crops started under the most favourable conditions, at the time of spring ploughing only the oats were of any practical value. Both varieties of these were free from rust and in first-class condition. While no doubt the severe winter was detrimental to the crops generally the poor results obtained from most of the cover-crops in this year's experiment are only consistent with the experience of the two previous seasons, when it was proved that on areas receiving manures specified and no lime the results in every case were unsatisfactory. It is interesting to note that the varieties of oats recorded proved an exception to this experience.

Humble-bees and Broad Beans.—The note by Mr. Hopkins on this subject in the October *Journal* indicates that he did not quite grasp the sense of the remarks made to him by a "leading horticulturist." Mr. Hopkins says that the early-grown beans fail most with him. That is the usual experience. The flowers begin to open when the temperature is too low to permit pollination, so the earliest flowers wither away. Then follows a lush spring growth, which I think does not favour the setting of the blossoms. As the days lengthen and the growth hardens, the blossoms set freely. My observations show that the nearer autumn the beans are planted the greater the number of the blossoms that fail to set. That the flush of growth has some influence is proved by the fact that runner-beans more often than not fail to produce beans from the first blossoms. Humble-bees undoubtedly do a good deal of damage where they are abundant, not to beans only but to ornamental flowering-plants. I have on a number of occasions seen the blooms of *Dielytra spectabilis* (lady's locket) quite destroyed. They wither away after being perforated by the humble-bees.—*W.H.T.*

State Nurseries and Plantations.—The annual report of the Forestry Branch of the Lands Department for 1917–18 states that during the year 6,882,700 trees were raised at the four nurseries, and 4,725,547 trees were sent to the various plantations and 530,458 to outside places. At the different plantations where planting was done a total new area of 2,653 acres was afforested. This brings the total area planted since operations began in 1896 to 32,645 acres, of which 21,792 acres are in the North Island and 10,853 acres in the South Island. During the year 487,560 trees, valued at £950, were sold to farmers under the scheme of State assistance in planting—an increase of 176,593 trees compared with such sales in the previous corresponding period.

When making concrete posts it is a good plan to mark the date on them. This is easily done with a nail a couple of hours or so after the posts are made in the moulds. The period of seasoning, &c., can be easily checked by this means.

WORK FOR THE COMING MONTH.

THE ORCHARD.

THE fruit crop in several districts is reported to have been seriously damaged by frost. This is very regrettable, for not only will the affected growers suffer financially, but all calculations as to the season's crop are for the time being completely upset. Certain projects, such as the erection of evaporation and cool-storage works, designed to meet the requirements of a normal season, which were under way in different districts, may also be affected. These will no doubt proceed, but the prospects of their successful operation for the first season will be less bright. There are still hopes, however, for the pip-fruit crop.

Frost damage, if not complete, is difficult to calculate. It is often in such cases that the damage is more in the nature of a severe thinning, and the crop, although light, is of much better quality, resulting in the total loss in weight being much less than at first anticipated.

Other districts have been more fortunate, having escaped this visitation. It may, however, be as well to intimate to growers, both within and without the frost-affected areas, that no relaxation can be expected in the standard of fruit-inspection on the markets as a result of light crops. Therefore growers, in view of the possibly higher quality, should in their own interests aid at reducing affection to a minimum. It has often happened in the past after frost-damage that growers have concluded that the apparently little fruit left on the tree was not worth the trouble of spraying, only to find later that the crop far exceeded expectations, but had been rendered worthless through disease.

Fruitgrowers throughout the Dominion will regret to learn that Mr. C. P. Taylor, President of the Canterbury Fruitgrowers' Association, was one of the many victims of the recent influenza epidemic. Mr. Taylor was well known among fruitgrowers for his sound ideas and work on behalf of the industry, particularly in the Canterbury District, where his loss will be keenly felt. *J. A. Campbell, Assistant Director of the Horticulture Division.*

AUCKLAND.

Weather conditions in the north during January are generally such as to favour the spread of infection from fungoid diseases, and also conducive to the increase of insect pests, therefore no relaxation in spraying operations should take place during the month if the best results are to be obtained.

Although a few of the earlier varieties of peaches will be taken off before, January may be considered the commencement of the fruit season. There will be several varieties of peaches and a few varieties of apples ready for market during the month. It is necessary here to point out the necessity for care and vigilance on the part of the consignor of stone-fruits. With regard to brown-rot the following suggestions should be noted: Do not pack bruised or punctured fruit; do not pack fruit even slightly affected with brown-rot; do not pick fruit too long before consigning, and wherever possible aim at getting it on the market not later than twenty-four hours after picking.

The most important operations to be carried out during the month are maintenance of thorough cultivation, spraying for codlin-moth, leaf-roller, bronze-beetle, black-spot, coniothecium, and bitter-rot of pip-fruits; brown-rot, rust, and black aphis of stone-fruits; and verrucosis of citrus fruits.

In regard to brown-rot of stone-fruits, should circumstances demand it further applications of either self-boiled lime-sulphur, 8–8–50, or commercial lime-sulphur, 1–125, may be applied as the fruit begins to ripen.

Spraying summary: Peach, nectarine, and plum: Commercial lime-sulphur, 1–125, or self-boiled lime-sulphur, 8–8–50—when fruit begins to ripen, and further as circumstances demand.

Pear, apple, and quince: Commercial lime-sulphur, 33° test, 1–100, in conjunction with arsenate-of-lead paste, 1½ lb., or powder, ¾ lb., to 50 gallons—every twenty-one days.

Lemon and orange: Bordeaux, 4–4–40—when petals have fallen from main crop of blossoms.

The commercial lime-sulphur applications should be continued wherever black-spot is showing. Plums may be kept free from attack of leech by application of arsenate-of-lead paste, 1 lb. to 50 gallons. Further application of McDougall's Insecticide, 1 to 50, may be required to control black aphis of peach.

—*J. W. Collard, Orchard Instructor, Auckland.*

HAWKE'S BAY.

Codlin-moth and leaf-roller: Keep the fruit on apple, pear, and quince trees covered with arsenate of lead, 1½ lb. paste or ¾ lb. powder, to 50 gallons. Spraying at intervals of three weeks is usually sufficient, but on some of the earlier, faster-swelling varieties a shorter interval is advisable.

Black-spot: Although the season so far has been a difficult one in which to fight this disease, from January onwards little or no trouble should be experienced. Nevertheless a watchful eye must be kept and the trees sprayed on the first sign of live fungus on either foliage or fruit. Use bordeaux, 3–4–50, or lime-sulphur, 1–100.

Powdery mildew: Regular spraying at intervals of three or four weeks with lime-sulphur or atomic sulphur should not be omitted for this trouble.

Leech: Very serious harm often results to trees by allowing this insect to strip the surface off the leaves. Spray all young fruiting or non-fruiting pear, plum, and cherry trees with arsenate of lead, 1 lb., or hellebore powder, 1½ lb., to 50 gallons. The former is the more reliable control. Use the latter on plums and cherries towards the ripening-period.

Brown-rot: If the weather is showery considerable infection can be expected. Endeavour to put the last spray on a week or ten days before picking. Use lime-sulphur, 1 to 100, on plums, and 1 to 120 to 130 on peaches and nectarines.

—*G. Esam, Orchard Instructor, Hastings.*

NELSON.

Stone-fruit crop: As the fruit attains some size the trees should be gone over at short intervals, and any fruit found affected with brown-rot fungus should be carefully gathered and properly destroyed. Without this precaution any system of spraying will be ineffectual. Spray as directed in last month's notes.

Under present circumstances the gathering and packing of the stone-fruit crop requires careful consideration. With one or two exceptions—cherries and the like—the fruit should be gathered as soon as it is full-sized and commencing to colour, and while it is still quite firm. All fruits in the least degree soft-ripe should be excluded from consignments.

Pip-fruit crop: Should a fungus spray still be needed lime-sulphur, 1–100 or 1–125, may be used. For codlin-moth or leaf-roller use arsenate-of-lead paste, 3 lb., or powder, 1¼ lb., to 100 gallons water. Towards the end of January migrations of woolly aphis commence. These may be checked by applications of Black Leaf 40, 1–800, and this mixture can be combined with arsenate of lead where desired. A point to be remembered is that Black Leaf 40 and other *contact* insecticides only destroy the insects they touch. Spraying to be effective, therefore, must cover the tree, specially the under-side of branches, and to the full depth of wounds and injuries on the trees.

The first fruit will be gathered from the apple-trees this month, commencing with Duchess of Oldenburg, Beauty of Bath, &c. In order to retain juiciness and

freshness of condition, these early sorts must be picked immediately they mature. The least delay is fatal to the proper condition of the fruit, and should it be necessary to hold them a while for marketing reasons the only way to do it is in cool store. If wrappers are not used in packing a paper liner in the case will go a long way towards keeping these goods fresh and bright.

Summer pruning: This operation when carried out on the completion of wood-growth during the month of January has the effect of checking the vigour of a tree and encouraging the formation of fruit-spurs and fruit. In the Nelson District where the fruitfulness of orchard-trees generally is such a remarkable feature, little time need be spent on this operation. There are, however, exceptions, chiefly in the case of some varieties of pears—Winter Cole, &c.—which under some circumstances are slow in coming into bearing. In such cases summer pruning is a powerful factor in bringing about the desired result. In peach, Japanese plum, and apricot trees, also, coarse "water" shoots often found growing about the centre of the trees should be completely removed.

Cultivation: In the average orchard thorough cultivation should be maintained. On the heavier flat land, where trees are vigorous and nearly full-grown, cultivation may often be discontinued at this time with great advantage.

—W. C. Hyde, Orchard Instructor, Nelson.

OTAGO.

Rather unseasonable weather prevailed during the greater part of November—heavy cold winds, with rain and frosts at intervals—and the season is about a fortnight backward.

Black-spot on the fruit and foliage of apple-trees is somewhat prevalent in some orchards, the infection having attacked apples during last month. Pears seem to be free, so far as I have observed. The recommendations for control made last month still hold good. Although the affected fruit cannot be cured the clean fruits can be protected, and in the case of foliage, growers must bear in mind that, as the infection is carried over on the dead leaves in the winter, the more diseased leaves that fall the greater the danger for next season's crop.

Mildew is making headway rapidly. Do not neglect the application of lime-sulphur, 1–120, or atomic sulphur, 10–100. It will pay to go through the trees and cut out all infected shoots and buds. Laterals are particularly prone to attack at the terminals. Cut back to the next well-developed bud, and burn all prunings.

Peach-rust will soon be making its appearance. Take preventive measures by spraying with lime-sulphur, 1–120, or atomic sulphur, 10–100, and repeat the treatment in about three weeks' time. This will also help to keep brown-rot in check should it make its appearance.

Red mite is not yet prevalent, but growers should be on the lookout for it as the weather gets warmer. Lime-sulphur and atomic sulphur at strengths just specified will keep it under.

Woolly aphis is increasing. Paint over the knots on the trees with red oil, one part to two parts of water, and spray with Black Leaf 40 at a strength of 1–800 to clean the young growths.

Do not neglect the arsenate of lead for codlin-moth and leaf-roller. Though the season is backward they will be on hand, even if a little late.

Cherry and pear slug is on the move, and precautions should be taken according to last month's notes.

Where peaches are still retaining heavy crops, especially Muir's, thin out well. These appear to be very susceptible to brown-rot, and should be kept single as much as possible.

Where thinning of apples is necessary remove all black-spotted ones and other deformed fruits especially. The loss of these will be made up by the quality of the remainder.

Where crops are light heavy growths will be resulting, and a little summer pruning by judiciously removing sappy growths in the centre of the trees, or reducing some of them to about three to four leaf-buds, will not be amiss. Do not be too drastic, however.

Stone-fruits will soon be right to harvest. The crops are not heavy, and the best should be made of them. Careful picking, grading, and packing will help considerably. Remember that co-operation is on its trial in this district. Uniform, honest packing will give buyers confidence.

—J. H. Thorp, Orchard Instructor, Dunedin.

POULTRY-KEEPING.

By F. C. BROWN, Chief Poultry Instructor.

WITH the plant carrying the maximum number of stock at the present time, and a great proportion of the birds not yet bringing in any return, it should go without saying that the poultryman must closely study the cost of production and eliminate any weaknesses that may be a drain on the profits. But while economy should be practised in every respect there must be no stint in the quantity of food supplied, as is too often the case at this season of the year. Instead of reducing the food-ration, the flock itself should be culled wherever possible. In the first place much can be saved by marketing at once any old hens that have passed their most profitable period of production. This also applies to old males that have been used for breeding purposes and will be useless for further service in the breeding-pen.

Another common weakness in management at this period of the year is to allow broody hens to sit on the nests for days and even weeks at a time. Not only does this mean a serious loss in eggs, but it encourages the presence of vermin. Some poultry-keepers imagine that by giving the birds a rest in this manner and at this time they will come on to lay in the winter months. Of course this is a mistake, as they will usually moult with the other members of the flock at the usual moulting period. It is now a recognized fact that if winter eggs are to be secured the pullet hatched at the right time must be depended upon to produce them. Some people resort to extremely cruel methods to put a hen off its broodiness, such as by confining it in a coop without food or water, or by dipping its head under water until it is nearly drowned. The best plan is to confine the hen in a coop with a slatted or wire-netting bottom, the coop being raised clear of the ground by means of two legs at each end. If the bird is removed from her usual surroundings on the first sign of broodiness she will soon lose her desire to sit. Broody hens should be given an ample supply of good nourishing food, so as to induce activity of the egg-organs and a resumption of egg-laying in the shortest space of time possible.

THE SURPLUS COCKERELS.

There is much to be lost and nothing to be gained by holding surplus cockerels after they have reached a marketable age. Any cockerels on the plant which it is not intended to keep for breeding purposes should be fed and managed in such a way at the present time that they will rapidly lay on flesh, in order that they may be marketed in prime condition when they reach the age of four and a half to five months. They should be placed in confined quarters where they will see only members of their own sex. The food should be supplied with a free hand, for no profit can be made from a cockerel sold as a table-bird which is neglected in any way or is kept on a lean diet. One means of reducing the cost of production is to provide ample green material. Another splendid food for fattening poultry is skim-milk. Where this is available there is nothing better for mixing the morning mash, while at the same time it can be given in large quantities for drinking.

It is useless trying to fatten cockerels if they or their quarters are infested with vermin. The birds should be dusted with a good insect-powder before the fattening process commences, while the quarters should be maintained in a thoroughly sanitary state. It is only by adopting such means that parasites as well as disease can be kept at bay. No cockerel intended for market purposes should be kept on the plant after it has reached the age of five months at the latest. Usually at about this age they commence to produce their adult feathers, and once this process begins it is impossible for a bird to put on flesh at the same time. Only the cockerel that develops rapidly at a young age returns the maximum profit. Therefore the greatest weight of flesh in the minimum period of time is the ideal to aim at. In addition to securing a high price for prime birds at a tender age there is the great advantage of having them out of the way, and thereby leaving more space for the young pullets, to say nothing of the saving of food and attendance.

DIET FOR GROWING AND ADULT STOCK.

A common practice on many plants at this season of the year is to feed both the growing and adult stock on the one class of food. Cases have recently come under my notice where the morning mash contained a high percentage of forcing-material, such as meat or blood-meal, this being supplied to all the flock irrespective of age. Of course this is a great mistake. It is sound policy to force all the eggs possible out of laying-hens—especially those it is intended to cull in the autumn, before they are sent to market. In the case, however, of growing stock, forcing-foods should be sparingly provided, or the birds are apt to mature at too early an age, with the result that they never grow to the desired size or lay a good marketable egg or one fit for hatching purposes. If the pullets or the cockerels intended for future breeding show the slightest sign of coming too early to maturity, all forcing-foods, such as meat or its substitutes or even milk, should be left out of the ration.

MARKING CHICKENS.

Poultry-keepers should not delay marking all chickens hatched this season, as a means of distinguishing the young from the old stock when culling is necessary—as it is every season if only profitable birds are to be retained. There is no definite natural means of telling the age of a fowl after it reaches maturity. This being so, the punching of a distinct mark in the web of the foot is the best way of providing a means of age-determination. A special punch for marking very young chicks may be obtained at a cost of about 2s. 6d., while a punch used for making eyelet-holes in boots (which may be purchased from any ironmonger) will serve for marking the foot when the birds are a few months old.

THE APIARY.

By E. A. EARP, Apiary Instructor.

QUEEN-EXCLUDERS.

THE coming month should prove the advantages to be gained by the use of excluders. In the colder districts they are of inestimable value in enabling the beekeeper to finish extracting before the hot weather

has altogether departed. Generally speaking, they should only be used during the main honey-flow. All sealed brood should be raised above the excluder, and the queen confined in the brood-chamber on drawn-out combs. After a few days the brood in the super should be examined in case queen-cells have been started, as it is almost impossible to find brood-combs which do not contain a few eggs, and the bees will often raise queen-cells on brood from which the queen has been separated. The queen will continue to lay on the empty combs provided, and as the brood in the upper story hatches the combs will be filled with honey—a great boon to the beekeeper who does not wish to extract brood-combs. By delaying the use of excluders till the main flow has started, one of their chief disadvantages, the promotion of excessive swarming, is largely obviated, as in most localities swarming stops automatically when clover blooms freely.

EXTRACTING.

By the end of this month extracting should have begun in the warmer parts of the Dominion, though farther south it may not commence till some little time later. The utensils for handling the honey should be thoroughly cleansed and scalded, and set up in the position they will occupy during the season. Everything should be tested to see that it will stand the strain of the season's work. Extracting is such high-pressure business that there is little time to stop for repairs once it commences in earnest. The uncapping-knives should be sharpened, strainers fitted with clean cheesecloth, brakes and belts inspected, and all machinery oiled and cleaned, so that matters will run smoothly during the few weeks that the main business of the apiary is in progress.

The honey may be extracted as soon as the combs are three-parts capped, and the operation repeated two or three times during the season. In fact, keeping the extractor running from the time the main flow sets in is perhaps the most satisfactory way of dealing with a honey crop, and is to be recommended where there is a possibility of thick honey being gathered. However, in clover districts, when the beekeeper possesses plenty of supers, the honey may be left in the hives till the end of the flow, and all the extracting done at one time. Although this ensures prime well-ripened honey it makes the handling of the crop very heavy work, and will give the beekeeper more trouble from robbers, which are always very much in evidence at the end of the season. In addition, in the colder localities heavily supered hives are apt to become chilled during the later part of the summer, and cold honey is much more difficult to extract than warm.

Once the honey leaves the hives it should be handled as cleanly and expeditiously as possible. Two or three zinc trays are a big help in disposing of drips, &c. One placed on the barrow which conveys the supers of combs to the honey-house, and another on the floor of the house to receive the supers prior to uncapping will save much unpleasantness to clothes and feet. These trays should have small blocks or supports fastened in each corner to raise the supers a little, so that the drippings from burr-combs, &c., may be drained away from the bottom edge of the supers. These trays are easily washed at the end of the day and drained dry ready for the next using. The extractor, uncapping-can, and honey-tank should be kept covered

when not in use with clean washing covers, and care should be taken that all bees, flies, and other extraneous things are excluded from the honey. From the peculiar nature of honey-production it is impossible to clean utensils day by day as is done with most foodstuffs, and it is imperative that honey be prevented from coming into contact with dirt and foreign substances.

PROVISION OF SUPERS.

On no account must the beekeeper neglect to provide his swarms with storage-room. If the weather is normal from ten to fifteen days after a strong swarm is hived it should be provided with a super. Not only is this necessary in order to obtain a surplus, but if it is not done the newly created colony will probably swarm again. A swarm is most vigorous and will usually make more headway than an established colony, and therefore should be encouraged by the provision of ample room. Many beekeepers deplete their honey crops considerably by failing to realize the fact that early swarms particularly will invariably yield a large surplus in a favourable season.

VENTILATION.

Every care should be taken to provide the bees with plenty of ventilation during the height of the summer. All entrances should be enlarged to their utmost capacity, and where the bees show a tendency to excessive fanning or clustering out, the hive should be raised from the bottom-board and any obstruction such as weeds, grass, &c., should be cleared away from the entrances. Most important of all, ample room should be provided by means of supers, as the overcrowding of the hive will tend to make the bees loaf if it does not produce excessive swarming.

FOUL-BROOD.

As soon as settled weather sets in the beekeeper should carefully examine his hives for disease and treat as soon as possible, so as to give his bees a chance to gather a surplus from the main flow. On no account should the operation be delayed until the bees are bringing in large quantities of the nectar that the beekeeper requires for extracting. The "Shake" or McEvoy method is the only one advocated, and the combs and frames should be treated and disposed of as soon as possible after the hives are dealt with.

QUEEN-RAISING.

The beekeeper should devote all the time he can spare to the important work of replacing old and failing queens, and if his stocks are of good quality he should endeavour to raise as many queens as possible in his own yard. Cells built under the swarming impulse are splendid for this purpose, and there are many ways of artificial queen-raising which are to be recommended. All the cells to be hatched should be given to nucleus hives to care for; queen-cells are seldom a success when introduced to full colonies. As soon as the young queens are mated and laying they should be placed in poor colonies, after killing the old queens, and their places filled by other ripe cells.

VITICULTURE.

By S. F. ANDERSON, Vine and Wine Instructor.

THE COOL VINEHOUSE.

THE very changeable weather experienced up to the present is having some effect on the appearance of the vines in those houses that are most exposed. The fruit is not so forward, and a flaccid hanging of leaves bespeaks the rapid changes of temperature. No doubt with more settled summer weather the vines will pick up. Close attention to ventilation is the best means to counteract such unseasonable conditions.

Thinning of bunches is now general. In growing vines under glass, where the utmost is being got out of the plant to make the industry pay, the thinning of the fruit is a very important work. Every available space should be fully occupied. Taking, for example, a house 51 ft. long and 16 ft. wide, with a 3 ft. side, a proper pitch of rafter would be 40 degrees, this giving a rafter 10 ft. long. Assuming the rods are 3 ft. apart, we have seventeen to a side or thirty-four together. These have a total running length of 340 ft. When the house has come into full bearing 1½ lb. of grapes to the foot in length would be a full but not an excessive crop. This would amount to 510 lb., and at 1s. 6d. per pound this would return £38 2s. 6d. Should the number of bunches be confined to one on each lateral without thinning, the weight of fruit might possibly reach the same figure—510 lb.—but its value on the market would not be 1s. 6d. per pound, very likely only 9d. per pound. When, however, the bunches are properly thinned the weight is not reduced and the market value is increased to double 9d. The importance of the thinning can thus be realized.

The operation of thinning is very simple. We will take the case of Black Hamburg, that vine being the one most generally grown. It usually has a nice compact bunch; starting from a strong stem it ramifies into lesser stems, and these again into triplets along the secondary stems. In most cases the terminal berry of each triplet is the best of the three and is left, and one or both of the side berries of this triplet is cut away. This system is followed throughout the bunch, and removes quite half the berries. It must be clearly understood, however, that no hard-and-fast rule can be laid down. Only by practice and care can any one attain speed in the work. The work must be done with the least possible handling of the fruit, as at this stage any injury soon shows black and remains a mark on the berry. To those inexperienced in vinegrowing it may seem a great waste to cut away so much fruit, but by this thinning berries can be obtained an inch in diameter, there is no waste, and a great increase in value.

THE VINEYARD.

The work in the vineyard will be confined to finishing up disbudding, keeping black-spot and mildew in check, and the land worked. The advantage to the vines of frequent cultivation can hardly be overestimated, especially during dry seasons. It checks evaporation

by the loose surface acting as a mulch. Its effect is to reflect the sun heat, making the temperature higher than is the case where the ground is left uncultivated and weedy, thus increasing the natural sugar in the grapes. Summer cultivation, indeed, is almost as indispensable as pruning. The cultivation should be such that it leaves the soil well pulverized. Cloddy ground minimizes capillary action, and thus moisture does not come to the surface. For summer cultivation 3 in. to 4 in. is deep enough, or even less in some soils.

THE GARDEN.

By W. H. TAYLOR, Horticulturist.

VEGETABLE-CULTURE.

THE winter supply of vegetables will largely depend on the work done in the next three or four weeks. During that period all the brassica family should be planted. Brussels sprouts should be got out as soon as possible; unless the plants are well grown before winter sets in they will be disappointing. The last planting of cauliflowers for the season is done now; they should head in April, and be followed by early broccolis, a full planting of which should be made, including early, mid-season, and late varieties. Cabbages should be planted, and last of all savoys and kales.

A suitable fertilizer for all these crops is blood-and-bone and superphosphate in equal parts, giving about 5 lb. per square rod, or basic slag, 6 lb. per square rod, applied before planting. In either case give nitrate of soda, 1 lb. per rod, after the plants begin to grow, and a similar dressing five or six weeks later. The first dressing of the nitrate should be strewn close to the plants, so that they may get it readily, or it can be applied in liquid form directly to the roots. In that case dissolve the nitrate in water, allowing $\frac{1}{4}$ oz. to each gallon, and give each plant 1 pint of the mixture.

Cabbages may be planted 2 ft. apart in rows 2 ft. 6 in. apart. Broccoli, cauliflowers, and Brussels sprouts require more room—2 ft. 6 in. in rows 3 ft. apart. Before planting place the plants in a tub in which is sufficient water to cover the roots, and let them remain for about an hour, by which time the plants will be well charged with water. When a bundle is taken from the tub lift a handful of mud from the bottom and rub it over the roots of the plants. The mud will protect the roots from the air and prevent them drying.

Planting is best done with a short-handled hoe. The hoe should be driven into the ground and, simultaneously with the blow necessary to drive it in, drawn towards the planter. A space will be opened beyond the hoe into which the roots of the plant are thrust. Now take the hoe out, and with the head give a smart punch to firm the soil. By this method the roots go into moist soil, none of the dry surface crumbs falling in as they do when a dibber is used, and no watering is needed.

Leeks: These, being one of the most useful winter vegetables, should be planted in quantity. They require deeply worked and rich soil. Plant in rows 18 in. apart and 9 in. or 10 in. in the rows. Draw a deep drill as for sowing peas, and along the drill strew some super and bonemeal. The plants should be of good size and be planted with a dibber, the latter being thrust in to its full length. The plants should be covered as deep as they will go without letting the soil into the crowns. At first let them in full length, then lift them to the height needed. This will straighten out the roots, which become doubled up when inserted. Press the dibber into the soil a few inches from the plant, with the handle sloped away from it; then bring the handle up to the plant, when the hole will be completely filled and the soil made firm. By the time the plants have made some growth the ground will be getting weedy. Hoe it over, at the same time filling the drills. The soil that fills the drills will cover any weeds there may be between the plants, and save the tiresome labour of hoeing or pulling them out. Grown in this way a plot of ground will hold twice as many leeks as it would if they were in trenches, and quite as large leeks can be grown. Before hoeing strew some nitrate of soda along the drill, 1 oz. to about 3 yards run.

Peas may be sown up to the middle of January, and French beans a fortnight later. Sow turnip, lettuce, radish, and onions for salading; also silver-beet, spinach, and red beet.

Tomatoes: Keep side shoots from advancing; nip them out as soon as seen. Top the main stems above the fifth or sixth bunch of fruit, according to the height of the supports. Spraying should be continued. As the weather has been very wet there will be considerable danger of blight-attacks, and the haulm should be kept practically covered with the bordeaux spray.

Potatoes: The same remarks apply as for tomatoes. The haulm is likely to be soft, and this condition lays them particularly open to attacks of late blight.

Onions are likely to be affected with mildew. Spraying should be attended to, or, if found more convenient, dust them with a mixture of sulphur and sifted air-slaked burnt lime, two parts of sulphur to one of lime. Keep all ground well clutivated so as to conserve moisture and suppress weeds.

SMALL FRUITS.

Strawberries: Where runners are wanted for new plantations layering should be attended to; if not wanted they should be suppressed. If plants produce an unrestricted number of runners they feel the strain and cannot develop crowns in a perfect manner. Nor can runners produce an indefinite number of new plants; two to each runner is all they can do properly; beyond that number they make very indifferent fruiting-plants for the next season. As soon as the new plants are securely rooted the connecting-links with the parent plants should be cut to enable the parent plants to use their energy for their own development. Where the system of planting admits, layering the plants where they are to remain without being disturbed should be carried out. This system secures stronger plants than is possible when they are transplanted, and they fruit as early as the old plants.

Gooseberries: The fruit being gathered, the bushes should be sprayed with 4–4–40 bordeaux for leaf-spot disease. If the bushes are crowded, first cut out sufficient branches to remedy this condition. It is better to do it now than to leave it till winter, because it will enable the bushes to mature the buds more perfectly, and because it is easier to see what cutting-out is necessary. The branches should be thinly disposed, so as to admit light to every part; only when they are in that condition will they give the crops they should. The bushes should be so formed as to render it easy to gather the fruit. If the fruit has to be searched for with much scratching of hands it is too crowded to be profitable.

Red currants: These bear fruit on second-year and older wood, never on young wood. The object should be to train permanent branches to carry the spurs. Branches must not be crowded; if they are, the spurs on the crowded parts remain dormant and eventually die. During summer numerous young shoots are formed. If these shoots are properly treated spurs will later on be formed at their base close to the parent branch. To effect this the shoots when about 12 in. long should be cut back to 6 in. The temporary check will concentrate sap in the basal buds. New shoots will shortly be thrown up from the tops of the shoots, but will not develop strong growth. The following winter these shoots are to be cut down to spurs about ¾ in. long. Note that if the young shoots are cut back in summer below the 6 in. mentioned the basal buds will at once break into wood growth and the object of pruning be defeated.

Raspberries: Keep surplus suckers cut out, not only in the alleys but also between the stools.

THE NATIVE FORESTS AND FORESTRY MATTERS.

THE following statement on the New Zealand native forests and kindred subjects, by Mr. E. Phillips Turner, forms part of the annual report of the Forestry Branch of the Lands and Survey Department for 1917–18. Mr. Turner has been connected with the branch for a number of years, and was recently appointed Chief Officer.

OUTPUT FROM MILLS.

At the present time the output of timber by the different mills cannot be satisfactorily obtained; approximations, however, are got by either personal inquiries made at the mills by departmental rangers or by application to sawmillers' associations. As far as could be ascertained, the total output for the year was 247,980,000 superficial feet, being 104,520,000 ft. less than for the previous year. Of the total production the Auckland Land District produced 87,165,516 ft., Wellington 69,120,000 ft., Westland 46,760,100 ft., and Southland 20,000,000 ft. In Canterbury there were about 1,000,000 sup. ft. of *Pinus radiata* and *Eucalyptus* timber milled, but practically no native timber, supplies of this last being obtained from other districts. The output of kauri was 20,890,359 sup. ft. Slackness in the building trade, scarcity of labour, shortage of tonnage for export, and other war conditions have all had an influence in lessening production.

EXPORT OF NATIVE TIMBERS.

The return furnished by the Comptroller of Customs shows the total export of native timber to have been 70,747,737 sup. ft., which is 6,768,119 sup. ft. less than for the previous year. The total value of the native timber and bark (28 tons, valued at £462) exported was £419,884. Owing to the fact that the war

has made it impossible for Australia to get her ordinary supplies of softwoods from America and the Baltic, there has been a keen demand for New Zealand softwoods by Australian merchants. White-pine and kauri are the chief timbers exported, but the export of rimu is increasing. There is also a small export of Southland beech (*Nothofagus Menziesii*) to Australia, and it is probable that after the war a good market for this timber will be found there—that is, if our own requirements do not necessitate action of a restrictive nature.

IMPORTS OF TIMBER.

The amount of timber imported during the year was (excluding laths, rails, posts, and shingles) 12,864,363 sup. ft., including 3,171,473 sup. ft. of Oregon pine which was 6,247,927 sup. ft. less than for the previous year. The total value of all timber imported was £139,095, being £51,808 less than for the previous year. The quantity of tan bark imported was 4,426 tons, valued at £46,480. In 1913 the quantity of timber imported was 46,907,877 sup. ft., which, together with round logs, laths, rails, posts, &c., was valued at £504,882. This big drop in imports is probably due solely to the effect of the war.

REVENUE RECEIVED FROM ROYALTIES AND SALES OF NATIVE TIMBER.

The revenue received during the year as royalties and rents from State forests was £10,536 13s. 1d., which was paid into the State Forests Account. The revenue received from licenses and sales of timber on national-endowment lands was £13,531. The revenue received from timber licenses and sales of timber on Crown lands was £10,063. The total of above amounts was £34,130 13s. 1d. These receipts have been credited to National Endowment Account and Territorial Revenue respectively, and were not available for forestry purposes. The total for the previous year was £32,247.

INCREASE IN PRICES OF TIMBER.

The prices given below are merchants' prices at Wellington, and it will be seen that there has been a considerable rise over the price for 1917. The rise is attributed mainly to increased wages that have to be paid for labour in the bush and in the mills, and to increased cost of machinery, wire rope, belting, oils, &c. The increased value that our ordinary building timbers have reached will tend to cause more care in the logging and milling operations, and in this way will lessen waste; higher values will also increase the use of some of the timbers that are at present milled only to a very limited extent.

Price per 100 Superficial Feet.

	1909.		1917.		1918.	
	Ordinary Building.	Clean Heart.	Ordinary Building.	Clean Heart.	Ordinary Building.	Clean Heart.
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Rimu	14 6	24 0	16 0	35 0	18 6	40 0
White-pine ..	13 6	..	16 6	..	21 6*	..
Matai	..	22 6	..	33 0	..	39 0
Kauri	..	29 6	..	43 0	..	48 0

* Clean sap white-pine suitable for butter-boxes and cooperage is 23s. 6d. per 100 sup. ft.

Though the above figures show that even in this Dominion there has been since 1909 a large rise in the value of timber, it is nevertheless small when compared with the rise that has taken place in the United Kingdom, for there the average value of 10,204,000 loads (which was the average amount of wood and timber, not counting products of wood) annually imported between 1909 and 1913 was £27,561,421; in 1915 the imports had dropped to 7,668,000 loads, but the value had risen to £32,788,324; whilst in 1916 the imports had dropped to 6,319,000 loads, and the value soared to £40,199,469. In January, 1913, 3 in. by 9 in. second Archangel white-spruce was 1s. 9d. per cubic foot, whilst in December of 1917 the price of the same material was 6s. 2d. per cubic foot, or £2 11s. 6d. per 100 ft. superficial for a timber inferior to our ordinary building-rimu.

INCREASING IMPORTANCE OF TIMBER.

In a report of the Reconstruction Committee (Forestry Sub-Committee) of the Ministry of Reconstruction (London, 1918) it is stated that there has been a steady rise in the price of timber since 1865. Between the years 1895 and 1913 there was a large increase in the United Kingdom in the consumption of coniferous timber and an increase in price of one-third. No substitute has been found for coniferous timber, which every year, either as timber or as pulp, is being used for new purposes throughout the world. Great Britain's ability to carry on the war has been due to the vast supplies of timber which have been imported from abroad. Timber has proved to be absolutely essential for the rapid construction of war works. The War Office alone in one year consumed 1,200,000,000 sup. ft. Through neglect to grow her own supplies Britain during the war has had to get her supplies from abroad. In doing this 13 per cent. of the total shipping was employed, which was more than the tonnage used for grain imports. The ships that carried the timber were largely foreign-owned, and the return freight was coal. Britain was therefore paying to foreigners a much enhanced price for the timber, and was hampered by having to mine coal for them; furthermore, the foreigner got the advantage of the increased freights. The report shows that America and Canada are now taking measures to bring their annual cut into conformity with the natural annual increment of their forests, and that the development that is likely to take place in Russia after the war will probably lessen the amount that that country has previously had for export. The Committee therefore recommended that the British Government should at once start extensive afforestation on the large area of poor lands in Great Britain and Ireland, and that at the same time (as it will be several years before there will be a substantial return from the afforested area) the Government should endeavour to arrange for its use a large area of forest in a British dominion or in a friendly country. "It may be argued that there may be such revolutions in industrial processes that wood will become unnecessary, both in war and in peace; there may be such a revolution in human nature that wars or trade boycotts between nations will become inconsiderable. There may be climatic or other natural changes which will either make the areas that are now afforestable unsuited for timber-growing or less valuable to the State for timber than for some other purpose which as yet we cannot imagine. We regard all these possibilities as very unlikely to happen in forty years, and we therefore cannot too strongly emphasize our conviction of the necessity for steady progress upon a definite plan for at least that time." There is still a large proportion of the population of this Dominion who (mainly for want of thought) are indifferent to the question of our timber-supplies, or who, though admitting the necessity of the use of timber, think our future supplies can easily be procured from abroad. Consideration of the foregoing should convince them that a *laissez-faire* policy is dangerous, and that true patriotism, concerning itself more with the future of the country than with the present, demands the application of such measures as will ensure a sustained supply for ourselves and those that will succeed us.

FOREST BY-PRODUCTS AND RESEARCH.

In America and Europe the war has stimulated research in connection with products from wood. Methods have been discovered by which alcohol for motor and other purposes can be profitably distilled from wood. Alcohol is now being obtained from the waste liquors of pulp-manufacture. Wood-flour is being largely made; it is used in the manufacture of dynamite, linoleum, wall-paper, wood plastics, and in Germany is used in admixture with ordinary flour from grain for human food. Our command of the sea has deprived Germany of her supplies of cotton, and that country is said to be using cellulose from wood as a substitute for it in the manufacture of her explosives. Numerous articles of clothing are now made from wood-pulp. By a subtle process the silkworm makes silk from the leaves of certain trees; by a chemical process man is now making silk from wood-pulp. In the United States one manufacturer of pulp building-board alone used 300,000,000 ft. of timber.

In this Dominion, at Palmerston North, a syndicate has started a plant for the distillation of spirit, oils, &c., from wood, and it is to be hoped that their enterprise will meet with success. Mr. B. C. Aston, Chemist of the Agriculture Department, has during the year made investigations with respect to the dyes obtainable from plants of the genus *Coprosma*, and has also determined the tannin-contents of the barks and timbers of various indigenous forest-trees. As a result

of his experiments it will probably be found profitable in the milling of our beeches to bark the logs and prepare from the bark a tannin extract.

In America portable distilling plants are used in the long-leaf pine (pitch-pine) forests of the southern States for the extraction of oils and resin from the stumps. There seems no reason why such a plant could not be successfully operated in a kauri forest, as the kauri resin would have a higher value than that obtained from the pitch-pine.

With the increasing importance of forest industries there is already abundant work for a special research officer, and antiseptic treatment, prevention of sap-stain, artificial seasoning, diseases of native trees, volume-increment of native trees, strengths, &c., are some of the many important matters awaiting investigation. Mr. Stanton Hicks, M.Sc., has carried out some interesting laboratory experiments in the fireproofing and antiseptic treatment of rimu, white-pine, and some of our beeches, and the results of his experiments are shortly to be published. It is to be hoped that he will be able to continue an investigation so important to the future of forestry in this country.

NEW USES FOR NATIVE TIMBERS.

There is little doubt that as kauri, rimu, matai, white-pine, &c., became scarcer, tawa, the beeches, taraire, &c., will be largely used. The chief defect of the beeches is the difficulty of seasoning them, but when seasoned they are certainly very fine timbers. The use of Southland beech for furniture is on the increase, and it is claimed that it has been successfully tested for butter-boxes. The very high prices of iron should have made a market for our mountain-cedar (kahikawaka), for this timber makes an excellent shingle—it is light, durable, easily split or sawn, and it is a very bad burning timber. It would also be most suitable for cutting into plaster-laths and venetian-blind slats. Even before the war had caused the rise in iron the Canadians and Americans largely used shingles. The scarcity of coal and its excessively high price must have made many people wonder why wood is not more used for fuel in this Dominion. In Canada, as a war measure, coal is being reserved for the requirements of the railways, factories, steamers, &c., and the use of wood fuel has become a necessity. Of late probably many people in this Dominion have wondered why high-priced coal, often difficult to obtain, is practically the only fuel—at least for town dwellers. The calorific value of American birch when dry is rather more than half that of an equal weight of anthracite coal. I am not aware that the calorific values of our woods have been properly tested, but I think it may be safely assumed that rata, maire, and manuka are superior to American birch, and that tawa and matai are about equal to it; or, say, the average native hardwood is equal to rather more than half its weight of our best coal. Seeing, then, that most of our large towns have timbered lands close to them, it seems strange that people use wood fuel so little. The taking of wood fuel from a forest would not, of course, destroy the forest, for under proper management its perpetuity could be ensured.

FOREST FIRES.

It is satisfactory to state that though last summer was very dry no milling forest was damaged to any serious extent; however, a very serious fire that started in the Raetihi farming areas spread so rapidly during a cyclonic storm that, in addition to several settlers' houses, nine timber-mills were destroyed. A fire that was started by lightning in the Dusky Hill Plantation during a thunderstorm, being soon discovered, was put out before any considerable damage was done. People in this Dominion are undoubtedly very careless in the matter of fires. In former years settlement was scattered, and forests by most people were considered to be too plentiful. Under such circumstances people set fire to felled bush, scrub, or fern, and never bothered to consider where the fire would end. Milling forest has now become scarce and more valuable, whilst settlement has extended. It is time, therefore, that this indifference as to fires should be checked, and it may be advisable to introduce some of the restrictive measures with regard to firing that are in force in Canada and the United States. Both those countries employ large staffs of men as fire rangers to protect their forests. Look-out stations, which are connected by telephone, are built in the forest, and should a fire occur assistance is at once procurable. The rangers have motor-boats on the lakes and rivers, gasoline fire-pumps, and apparatus for tapping the telephone-wires. They have the power of special constables, and may call on any civilians to help them in putting out fires. In Canada after the war it is proposed to employ airplanes in connection with forest-protection. The different Provincial Governments spend

considerable sums in erecting conspicuous placards which set out the commercial and other values of forest to a country, and which quote the number of lives lost and the property that has been destroyed in previous years; people are taught that fire is their enemy, and that it is easily prevented, but difficult to overcome when started. It is considered that money spent on fire-ranging is merely an insurance of the forest.

FOREST PESTS.

For the purposes of sport in this country there have been introduced various animals, some of which are now threatening to become serious pests. The opossum eats the berries and seedlings of many trees, and where these animals are abundant they would have an appreciably deterrent effect on natural regeneration. They yield, however, valuable skins, and as they are easily trapped the damage they do may be compensated for by the return from the skins. A more serious pest are imported deer. These animals afford a good sport, no doubt, but it is enjoyed by a very limited number of people, and the animals yield no revenue worth speaking of. On the other hand, they are becoming a serious nuisance in our artificial plantations, and where present in our native forest they destroy a large amount of young growth—in fact, if not kept down they will entirely prevent regeneration of the forest, as Professor Somerville has proved they have done in Scotland.

In my travels through the Dominion I have observed in many places that many varieties of imported trees are being attacked by fungoid and insect pests. Even the vigorous *Pinus radiata* is frequently seen affected with a leaf-shedding disease (caused by a minute fungus); the disease from which the valuable *Cupressus macrocarpa* suffers is seen from north to south; the silver-wattle is often defoliated by a small fly; and many of the gums are seriously affected with a scale insect; chestnut and other trees are also seen affected by disease. Seeing that an increasing amount of money is being invested by the State, local bodies, and private persons in tree plantations, it seems advisable that some action should be taken to institute measures for the control or prevention of forest-tree pests. Most valuable forests of Weymouth pine in Europe and America have been ruined by a blister-rust. As the black currant and gooseberry and their relations are the intermediate hosts for this rust, all these plants should be prohibited from being imported into New Zealand.

NEW FOREST RESERVATIONS AND WITHDRAWALS FROM RESERVATIONS.

During the year a total area of 9,496 acres was proclaimed State forest, and 3,724 acres were withdrawn from reservation for the purposes of settlement.

Trade between Australia and South Africa.—For some time past an acute shortage of shipping to handle the trade between Australia and South Africa (also affecting transhipments from New Zealand) has existed. The New Zealand Trade Commissioner in Melbourne, reporting under date 28th November, states that the position had become accentuated, inasmuch as there were still larger accumulations of cargo awaiting shipment owing to only one steamer of 1,000 tons capacity being engaged in the trade. It was hoped, however, that within four or five months more tonnage for this trade would be available.

Importation of Grapes.—The prohibition of the importation of grapes into New Zealand, except from Australia, has now been relaxed as regards the United States of America, and Canada, under the following conditions: Every shipment of grapes must be accompanied by a certificate signed by the shipper, setting forth the number and kind of packages, the shipping-marks, the name of the grower, the locality, and the State or Province where grown, and certifying that no phylloxera is known to exist in or within one mile of the vineyard, that no grape-vine foliage or wood is attached to the grapes, that no grapes from any other vineyard have been mixed with the consignment, and that the grapes are contained in clean new packages not previously used for any purpose; also by a certificate, signed by an officer of the Department of Agriculture in the State or Province where the grapes were grown, certifying that they are clean and free from disease, that no phylloxera is known to exist in or within one mile of the vineyard where the grapes are certified by the shipper to have been grown, and that no grape-vine foliage or wood is attached to them.

ANSWERS TO CORRESPONDENTS.

IN order to ensure reply to questions, correspondents must give their name and address, not necessarily for publication, but as a guarantee of good faith. Letters should be addressed to the Editor.

LAMBS WITH SORE NOSES AND LIPS.

E. L. TUCKER, Ohinewai :—

I would like to know the reason why lambs that are running with two- and four-tooth ewes on grass pasture (river-flats) should develop sore noses and sore lips. Lambs running with older ewes pasturing on similar country, and receiving the same amount of change of paddocks, seem to be immune. I have applied a wash of Kerol, 1 in 80, to affected lambs. Would you advise if contagious and, if so, correct treatment ?

The Live-stock Division :—

The disease you describe is contagious, and the wash you have applied should do good. If you find that this is not the case, apply a liberal smearing of sulphur ointment—1 of sulphur to 8 of vaseline—to the affected parts, also inside the lips.

PASTURE DEVELOPMENT.

"INQUIRER," Tokaroa, Putaruru :—

Would you kindly let me know if it is advisable to top-dress pasture in the autumn on pumice country ? I was thinking of using 2 cwt. of lime and 1 cwt. of super per acre if suitable, and at the same time running a little white-clover seed with the manure to fill up bare spaces—say about 2 lb. per acre. Also, what grasses would be suitable to sow on hillsides that have been disked out of fern, scrub, and tutu, and would paspalum or danthonia surface-sown after a burn on these hillsides be profitable ? I may state this country is high-lying, about 1,500 ft. above sea-level, and we get frosts now and again between June and October, and have a heavy rainfall throughout the year.

The Fields Division :—

The top-dressing would best be done in the very early spring, and the sowing of from 2 lb. to 3 lb. of clovers, both white and red, along with the manure is an excellent practice. For the fern hills we should advise sowing in January or February, according to weather conditions, a mixture somewhat as follows : Italian rye, 6 lb. ; cocksfoot, 8 lb. ; crested dogstail, 2 lb. ; brown-top, 1 lb. ; poa pratensis, 1 lb. ; danthonia, 4 lb. ; paspalum, 1 lb. ; red clover, 2 lb. ; white clover, 1 lb.

HOW TO MAKE BASIC SUPERPHOSPHATE.

C. STEWART, Oparau :—

Please tell me how to make basic super ? Do you use burnt lime or crushed, and what proportion of lime to superphosphate ?

The Fields Division :—

To make basic superphosphate mix thoroughly 1 part by weight of ground burnt lime with 6 parts by weight of super, or 1 part by weight of ground limestone with 3¼ parts by weight of super. The equivalent in phosphoric-acid content of 3 cwt. superphosphate would be 3½ cwt. basic superphosphate, if burnt lime is used in the making ; or 3 cwt. 96 lb. if ground limestone is used.

ERADICATING RATSTAIL-GRASS.

I. G. MUNRO, Puketapu :—

Which is the easiest and best way of eradicating ratstail-grass which is growing on rough country ?

The Fields Division :—

Unless the land can be ploughed it is virtually impossible to eradicate ratstail when once it is well established.

HORSE WITH LICE.

C. F. McM., Maungati :—

I have a four-year-old draught horse troubled with lice. I have washed him in Jeyes' fluid without success, and should be glad to know the best remedy.

The Live-stock Division :—

The treatment for lice on horses consists in clipping the animal all over, and then washing it with a strong solution of soap and water. When dry apply a mixture of fish-oil, 8 parts, and petroleum, 1 part. Remove as much as possible of this application the next day by scraping with a scraper or piece of hoop-iron. It should be seen also that the rug and stable are thoroughly disinfected.

TREES AFFECTED WITH SILVER-BLIGHT.

"SETTLER," Glenavy :—

Can anything be done with silver-blight on apple-trees when fruit is forming ? Two years ago I sprayed when fruit was the size of pigeon-eggs with bluestone, 1–60 strength, and killed the fruit on about two-thirds of the trees.

The Horticulture Division :—

Spraying will have no remedial effect on trees affected with silver-blight. Branches that are badly affected should be cut off below the point of infection, as there is no known cure for the disease. Bluestone should not be used without lime on growing trees ; it is sure to burn. A strength of 1 in 60 could not be effective against any disease, though it would burn fruit and foliage.

ROOT CROPS FOR TARANAKI CONDITIONS.

"SWEDE TURNIP," Eltham :—

I have taken two crops of swedes off a piece of ground. Do you think it would be safe (from blight or club-root) to try a third crop, or would it be better to put in soft turnips ? Would lime be any help ? I have not been able to get any fresh ground stumped, and would like to get some feed to help through the winter. This is new country and the crop is fed off the ground.

The Fields Division :—

There is very considerable risk that a third crop of swedes in succession would be ruined by club-root ; in fact, the risk is so great in your district that such a practice should only be undertaken if it is absolutely necessary for you to have swedes. Substituting soft turnips for swedes on land that has previously carried two swede crops is worse than trying a third crop of swedes—at least, this is almost always true where turnips are sown before Christmas. In certain instances soft turnips sown late in February on land previously cropped twice with swedes and turnips have escaped severe infection with club-root. If you do sow swedes we should advise liming with ground agricultural lime at the rate of 1½ tons per acre, but such treatment is no criterion that the crop will be satisfactory. Mangolds or carrots would be good alternatives for your conditions, but it is now late for these crops.

TIMES FOR PLANTING OUT VEGETABLES.

M. C. SMITH, Khandallah :—

In the *Journal* of May, 1917, was given a very useful calendar for vegetables all the year round, giving times to sow seed. With reference to the brassica tribe I shall be glad if a similar indication could be given as to when to plant out, for, like many others, I find it more convenient to purchase the plants I want than to grow from seed. I am referring only to brussels sprouts, broccoli, cabbages of all kinds, cauliflower, and kale.

The Horticulture Division :—

The information you seek has been supplied in the *Journal* from time to time. Brussels sprouts should be planted in December, or early in January at the latest; these are planted only once each year. Early broccoli should be planted in December, the later varieties not later than the third week in January; kales in January; cauliflowers in June or July, October, and early in January. Cabbages may be planted at any time from June to January, but if sufficient are planted a supply for the year can be had by planting towards the end of June or in July, from seeds sown the last week in March or first week in April; in October, from seed sown in July; and a last planting in January. Cabbages and savoys sometimes succeed when planted a few weeks later than the time stated, but success is dependent on weather and is not to be relied on.

A FOUR-YEAR LEA.

"INQUIRER," Te Puke :—

What is the best mixture of grass to sow in the sandy-loam soil of this district for a four years' lea? Taking into consideration the present high price of manures what would be the best manure to use?

The Fields Division :—

The following mixture should suit your soil and location: Italian rye, 5 lb.; perennial rye, 10 lb.; cocksfoot, 8 lb.; crested dogstail, 2 lb.; red clover, 4 lb.; white clover, 2 lb. For manuring use basic super at the rate of 2 cwt. per acre, and in the second season, provided prices and supplies are satisfactory, dress with 2 cwt. of basic slag.

SHEEP-WORMS IN PASTURES.

"SUBSCRIBER," Sandspit :—

Kindly inform me if it is a fact that sheep feeding on Danthonia pilosa pasture get worms?

The Live-stock Division :—

No grasses are exempt from harbouring worms or other parasites when once they have taken possession of any paddock.

CURING AND TANNING SKINS.

"HUNTER," Rangiora :—

Could you kindly supply me with a recipe for curing and tanning hare and rabbit skins?

The Live-stock Division :—

The curing of such skins is a technical business undertaken by furriers, and it is not feasible for us to go fully into the matter. We would recommend you to procure a small book entitled "Taxidermy," published by Cassell and Co., Melbourne, which can be had at booksellers in New Zealand, price 2s. This will be found a very handy work for the purpose in question.

TOTARA HEDGE.

W. J. KIRK, Levin :—

I wish to grow a hedge of totara. Please give directions for growing from cuttings.

The Horticulture Division :—

Totara cuttings should be side shoots of the current season. The shoots may be 4 in. to 6 in. long, and should be taken with a heel of the old wood. The month of May is the best time, but cuttings may succeed if put in at any time from the end of April till the end of August. The cuttings may be put out in nursery rows in friable soil, in which case nothing is required but to tread them in tight and keep the surface loose. The cuttings are slow to root. At the end of the year they will have made but very few roots, and scarcely any top growth. As it takes at least two years to get plants from cuttings large enough to plant out, the most economical method is to root them in boxes. Boxes should be about 4 in. deep. Fill them with ordinary garden soil that has no manure in it, leaving room for 1 in. deep of sand on top. The cuttings may be placed as close together as they will go. When the box is filled with cuttings give a good watering through the rose of a watering-can. Stand the box in a sheltered position in the open air. Twelve months later take the cuttings from the box, and plant those that have rooted in nursery rows.

NOTICE.—A reply cannot be given to "Farmer, Christchurch," unless he supplies his name and full address.

THE SEASON'S LAMBING.

FOLLOWING are complete estimates of the current season's lambing, computed from estimated average percentages of lambs dropped, furnished by the Department's Inspectors of Stock in the various districts. Corresponding figures for the three previous years, together with the actual numbers of lambs tailed, are also given for comparison.

Year.	Number of Ewes put to Ram.	Estimated Average Percentage of Lambing.	Estimated Number of Lambs.	Actual Number of Lambs tailed.
		NORTH ISLAND.		
1918 ..	6,846,049	85⅝	5,881,682	(Not yet collected.)
1917 ..	7,475,418	87½	6,539,033	6,292,838
1916 ..	7,230,450	85¾	6,203,726	6,212,573
1915 ..	6,643,567	86½	5,753,329	5,771,143
		SOUTH ISLAND.		
1918 ..	6,175,981	76½	4,728,391	(Not yet collected.)
1917 ..	5,784,751	87¼	5,072,307	4,901,329
1916 ..	5,662,317	80	4,529,835	4,532,813
1915 ..	5,938,258	80	4,777,451	4,599,628
		DOMINION.		
1918 ..	13,022,030	81½	10,610,073	(Not yet collected.)
1917 ..	13,260,169	87½	11,611,340	11,194,167
1916 ..	12,892,767	83¼	10,733,579	10,745,386
1915 ..	12,581,825	83½	10,530,780	10,370,771